Vol. 4 MARCH, 1923 No. 12

First Copy

THE PAPER INDUSTRY

The Monthly Educational Journal of the Paper Industry.

AGENTS

A/S TOTEN CELLULOSEFABRIK

Bleached and Easy Bleaching SULPHITE

PERKINS-GOODWIN CO.

NEW YORK

PULP and PAPER

AGENTS

SUNDS AKTIEBOLAG

STRONG SULPHITE

INDIRECT COOKING

At the

EXPOSITION

Visit Spaces
Nos. 69-70-77-78

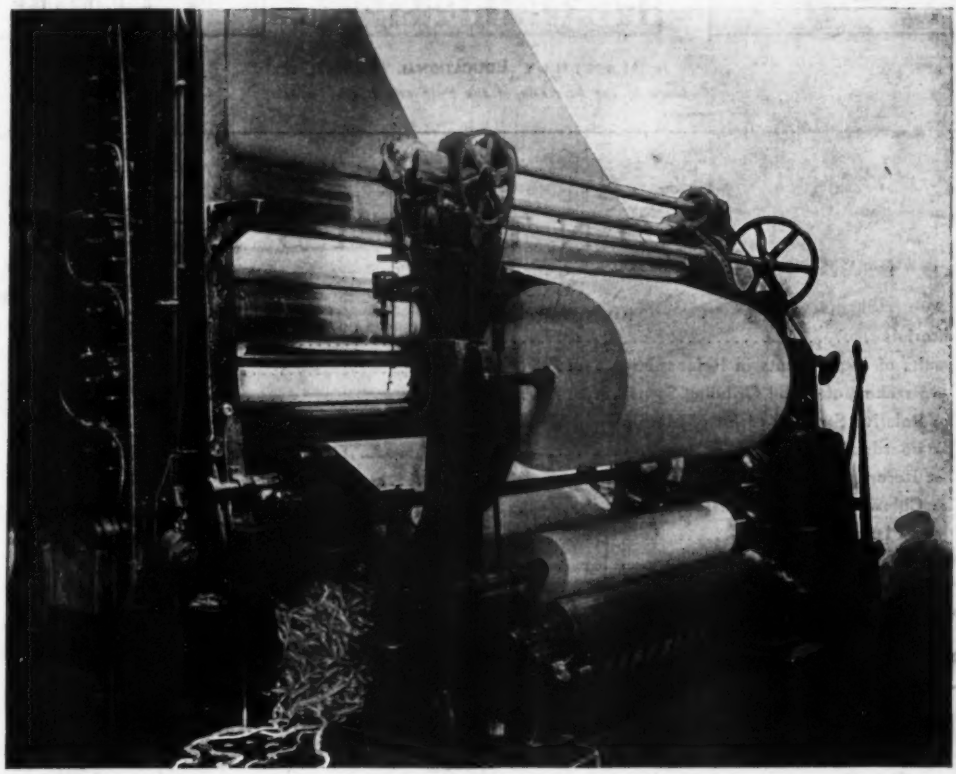
For the most complete line of up-to-date Paper Machinery that can be manufactured

We will have several important new features which will be of interest to you

The Bagley and Sewall Company

WATERTOWN, NEW YORK

Super Calender Winders



Photograph taken in one of the mills of the Kimberly-Clark Co.

To the Paper Mill Manager

ILLUSTRATION shows the latest type of Drum Winder for use with Super Calenders. Its function being able to make shipping rolls direct from Super Calenders without rewinding, eliminates waste, saves additional labor cost, does away with soft winding, and rolls are trimmed on both ends.

It is also advantageous when calendering papers in process. Straight hard rolls can be obtained without wrinkles thereby obviating surplus trimming waste in finishing room. It also permits a faster calendering speed because rolls are straight, and tension on sheet can be better regulated.

Rolls can be readily changed from winding drums to unwinding shaft by means of electric motor lift, self-contained with machine.

This Winder is built in two types—Standard for widths up to 109"; Heavy type, for wider machines.

A number of these Winders are in successful operation in various mills. One of the largest mills in the country making high-grade Super-Calender paper is using twenty-two of them, and at present have all their Calenders in their various mills equipped with these Winders.

Should you desire further information we request that you send us following information:

1. Width of Calender stack and diameter of bottom roll.
2. Right or left hand machine.
3. Diameter rewinder shaft.
4. Size cores used.
5. Voltage, phase and cycles of current used.

On receipt of above data we will be glad to send you blueprints, and prices, and if desired we would arrange to have one of our representatives call when in your vicinity, or at any time convenient to you.

We are prepared to furnish Winders and Slitters for all classes of work as desired

THE MOORE & WHITE CO.

ESTABLISHED 1866

Paper Machine Builders

No. Phila. Sta., P. R. R. **PHILADELPHIA, U. S. A.**

Vol. 4—No. 12

THE PAPER INDUSTRY

A. SCOTT DOWD
Editor

A MONTHLY EDUCATIONAL JOURNAL
Devoted to the Interests of the Pulp and Paper Industry

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Eastern Office: 52 Park Place, New York City

WHAT WILL THE DYE DO ?

The right dye
—a "National" Dye—

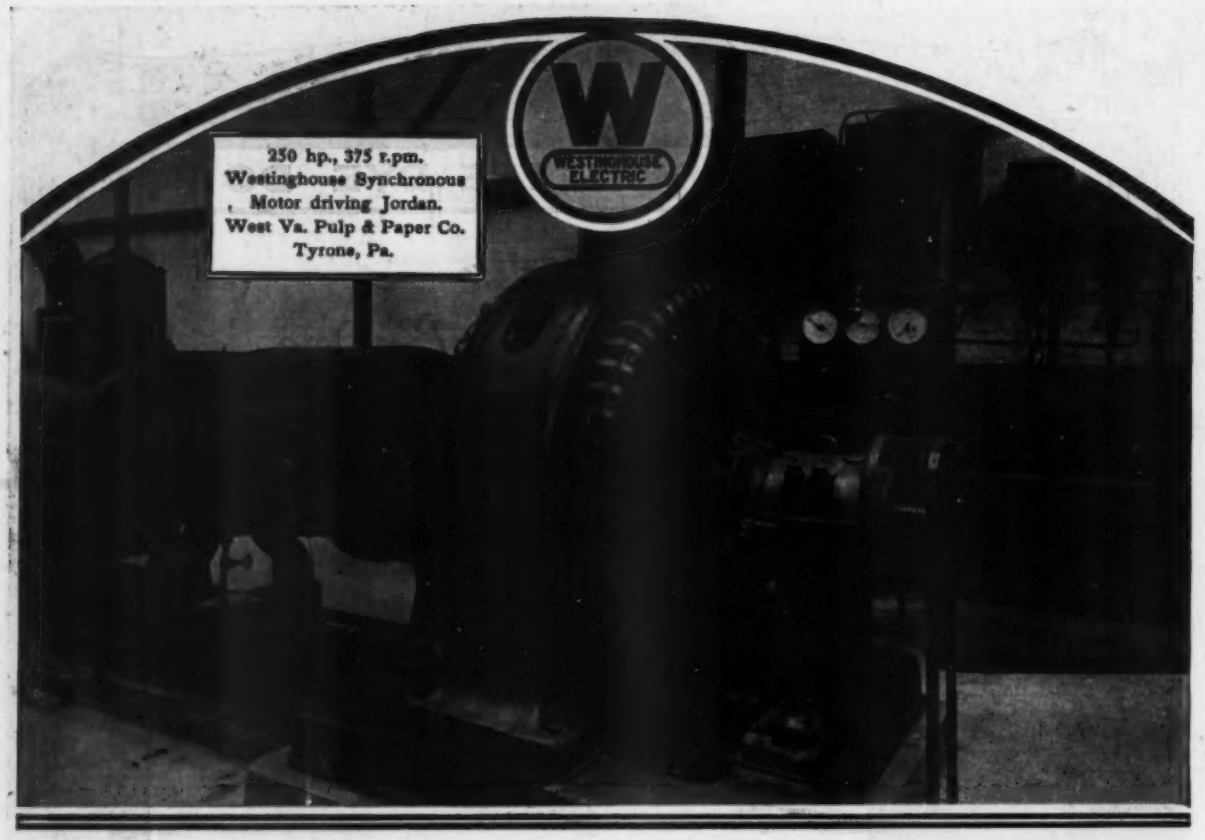
will keep your paper uniform in color. The right "National" dye will turn out the right color every time. Uniformity is a quality that is a part of every National Dye—you can depend on it. "National" will keep your colors standard.

National Aniline and Chemical Co., Inc.
40 Rector Street, New York, N. Y.

Boston *Charlotte* *Providence*
Chicago *Montreal* *Philadelphia*
Hartford *Toronto* *San Francisco*

"NATIONAL" DYES
FOR PAPER

NATIONAL U.S.A. DYES



The use of Westinghouse synchronous motors for Jordan drive is followed by a marked improvement in plant power factor—

ADVANTAGES

In addition to improved power factor secured by the use of Westinghouse Synchronous Motors for Jordan drive, motor drive permits of the best arrangement of machines for the paper making process.

Line shafting and belt maintenance is eliminated, power cost reduced and highest overall plant efficiency attained.

Power consumption can be measured by electrical instruments and inconsistencies in plant operation readily traced to the offending cause.

The Jordan, with its fairly constant load and low starting torque, is an ideal machine for synchronous motor drive.

When Jordans are synchronous-motor-driven you secure not only the benefits of motor drive over the line shaft and belt method, but also improved line conditions and power factor correction.

While some paper manufacturers prefer synchronous motors exclusively for Jordan drive, others install them only in sufficient number to effect the much desired result—power factor correction.

Write our nearest district office for complete information on the benefits of Westinghouse Synchronous Motor Drive.

Westinghouse Electric & Manufacturing Co.
East Pittsburgh, Pa.
Sales Offices In All Principal American Cities.

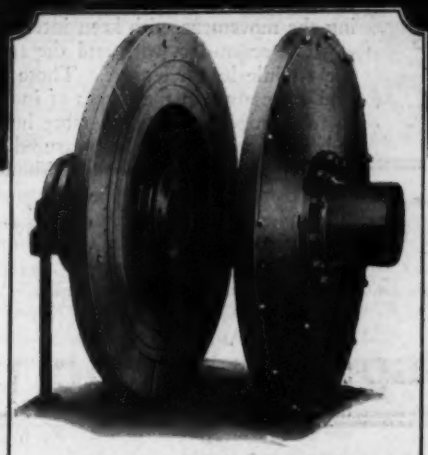
Westinghouse

The Ideal Clutch on Grinder Drives

THE C-H Magnetic Clutch does not grab as instantly as a jaw clutch. When the load is to be picked up, an attendant presses a button or closes a small switch. There is just enough slippage while the magnetic force is building up to reduce the shock of starting.

This clutch makes it possible also to employ a synchronous type of motor which, having practically no starting torque, is brought up to full speed before the clutch is engaged. This type of motor has advantages which make it desirable to use when possible.

The C-H Magnetic Clutch requires small space and may be located below floors, in pits, overhead, or (since no attention is required) in inaccessible locations. Control stations may be located convenient to the user.



The C-H Magnetic Clutch consists of but two parts, one of which carries the magnetic coils. There are no toggles, links, or levers.

On a tissue paper machine drive, a 30-inch C-H Magnetic Clutch was installed on the floor below with control switch on the floor above. Production was increased and depreciation on felts greatly reduced. As a result all machines of this mill are equipped with these clutches.

At the Neenah Paper Co. mill a C-H Magnetic Clutch prevents the over-speeding of mill drive when the mill load is reduced or removed, the engagement and disengagement of which is controlled by a centrifugal governor.

THE CUTLER-HAMMER MFG. CO.

Magnet and Clutch Dept.
Works: MILWAUKEE and NEW YORK
Offices and Agents in Principal Cities
Northern Electric Co., Ltd., Can.

C-H CUTLER-HAMMER **MAGNETIC CLUTCHES**

Secretary of Labor Davis Endorses Action of Boxboard Manufacturers

Little can be added to the letter written by Secretary of Labor Davis and reproduced below. It speaks for itself, for him and for a broad principle

Department of Labor,
Office of the Secretary, Washington

MR. MONTAGUE FERRY, JANUARY 13, 1923.
ARMSTRONG BUREAU OF RELATED INDUSTRIES,
400 North Michigan Avenue, Chicago.
MY DEAR MR. FERRY:

I have noted with great interest the development of the movement among the boxboard manufacturers to get away from the seven-day week and the twelve-hour day in that industry. I want to congratulate those who are active in its accomplishment. The Department of Labor is watching the movement with keen interest.

The seven-day week and the twelve-hour day in the United States in my estimation cannot a great while longer endure. Those industries which try to perpetuate them must sooner or later find themselves in the throes of industrial conflicts that will cost far more than would be required to reorganize them upon a more humane basis. The cost of the continuance of these principles in industry cannot alone be measured in terms of money but in the sympathy and good will of the public, as well as employees, without which most men would not desire to remain in industry.

Society cannot afford to permit an industry to unmake men in order to make boxboards or anything else. It is almost universally, and especially in America, recognized that good government and society must rest upon the welfare of the home. The home of a man who works seven days—eighty-four hours—each week cannot in the very nature of things be the kind of a home in which good citizenship can be developed. We cannot look upon the home which the father leaves before the waking hour of his babies, to return after they have been put to bed by the mother of the family, as a model American household. Not only is it unfair to the father and his overworked partner in life that this should prevail, but the effect upon the rising generation cannot be overestimated. The basis of our family life, which will be reflected in our social order, must be a relationship of love and understanding. Unless the father is permitted to have enough time to himself in the home to play with his youngsters, and as we might say, become acquainted, the ideal of American principles cannot be reached.

* * * * * * * * *

Industries that require continuous process production got into the habit of long hours and the seven-day week before either the social side of industry or real labor efficiency had been studied or even carefully observed, and I know that it is hard to break away from old industrial customs, and this is why I am gratified to know that the boxboard industry with its hundred million dollars' output per year, and its twelve or thirteen thousand employees, is of its own volition inaugurating a change that will break away from the old and unprofitable and unsocial habits of the past and reorganize the industry within itself upon more up to date and socially progressive lines.

Sincerely yours,

JAMES J. DAVIS, *Secretary.*

(The full text of Secretary Davis' letter will be forwarded upon request.)

The signers and sponsors of this advertisement have no desire to be exclusive, and will cordially welcome to their ranks all other boxboard manufacturers who believe in the principles set forth by Secretary Davis and are willing to act on their belief. Address any of the signers or the Armstrong Bureau of Related Industries, 400 North Michigan Avenue, Chicago.

Alton Box Board & Paper Co.....Alton, Illinois	R. B. McEwan & Son.....Whippany, New Jersey
American Box Board Co.....Grand Rapids, Michigan	Mid-West Box Company.....Chicago, Illinois
Chicago Mill & Lumber Company.....Chicago, Illinois	Monroe Paper Products Company.....Monroe, Michigan
Consolidated Paper Company.....Monroe, Michigan	The B. F. Nelson Mfg. Co.....Minneapolis, Minnesota
Continental Paper Company.....Bogota, New Jersey	Philadelphia Paper Mfg. Co.....Philadelphia, Pennsylvania
Robert Gair Company.....New York and Chicago	The Richardson Company.....Lockland, Ohio
Lafayette Box Board & Paper Co.....Lafayette, Indiana	River Raisin Paper Company.....Monroe, Michigan
McEwan Brothers.....Whippany, New Jersey	Rockford Paper Box Board Co.....Rockford, Illinois
John Strange Paper Company.....Menasha, Wisconsin	

Even the most modern paper mills are made more profitable by these specialists

VENTILATION is a thing easily overlooked—a condition that does not demand attention until after production is under way.

When the new building is planned, every modern labor-saving device and method is considered. But it is only after the payroll has started that the menace of condensation in the machine room and fumes in the sulphide room makes itself apparent.

Arex engineers daily find new buildings in which the effectiveness of modern equipment is nullified by the lack of proper ventilation. Great clouds of vapor over the machines mean "broke" being sent daily to the beater room because of spots and tears—a costly indemnity for lack of proper ventilation.

Arex ventilation is practical for one room or your entire mill, and will pay for itself within a few months in the savings it effects.

A rough sketch or blue print of your building attached to the specification blank below carrying a description of your conditions will bring you a complete survey by these experts without cost or obligation. Address Arex Company, Engineering Division, 1578 Conway Building, Chicago.

Some Typical Arex Installations in Paper and Pulp Mills

Northwest Paper Company
Whiting Plover Paper Company
Gilbert Paper Company
The Ohio Paper Company
Flambeau Paper Company
John Strange Paper Company
Lakeside Paper Company
Appleton Coated Paper Company
Harding Paper Company
B. D. Rising Paper Company
Aetna Paper Company
Chemical Paper Mfg. Company
Certainteed Products Company
Pilkington Bros.

AREX COMPANY

J. C. Kernchen, Pres.

INDUSTRIAL VENTILATING ENGINEERS

Arex Ventilation Engineering Survey **SPECIFICATION BLANK**

We desire to receive *Gratis* an engineer's analysis of the following building: ..... *State character of work or business building is used for*

We are troubled with: Fumes ☐ Smoke ☐ Foul Air ☐ Heat ☐ Condensation ☐ Steam ☐

Dimensions of Building: Width.....Ft. Length.....Ft. Ceiling Height.....Ft.

Construction of Building: State whether Brick ☐ Concrete ☐ Frame ☐ Stucco ☐

Type of Roof: State whether Flat ☐ Slant ☐ Gable ☐ Sawtooth ☐ Monitor ☐

Pitch of Roof..... State how many..... inches to the foot.....

Location of Floor or Room to be ventilated.....

How high do adjoining Buildings extend over your Roof?.....

How many feet distant are the surrounding Buildings, or is your Building entirely unsurrounded? .....

Firm Name ..... Name of Individual ..... Title of Individual .....

Street Address ..... City ..... State .....

Send rough sketch or blue print of building with data for engineer's analysis

THE SECRET OF ITS DURABILITY

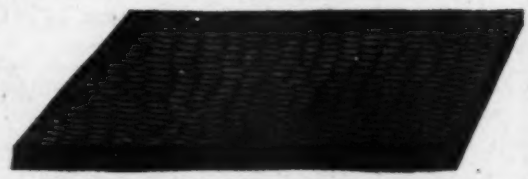
AUTHENTIC data from over 250 years of service prove that cast iron becomes coated with rust but remains practically unimpaired in weight and strength under conditions that are fatal to other kinds of pipe.

Scientists believe this phenomena due to what has been termed the "mechanical theory of corrosion." Cast iron possesses a structure of the same granular or crystalline form as found in the iron ore from which it is made and which has laid unimpaired in the ground for untold centuries. Cast iron rusts on the surface, but the corrosive agent fails to break the natural mechanical bond between the irregular shaped granules, further oxygen is excluded by the first rust coating and therefore corrosion stops. Cast iron literally coats itself.

The reason the same thing does not occur on wrought iron or steel is that the "mechanical structure" of these metals is different. In place of the interlocked grains or crystals of cast iron, wrought iron and steel are found to be of a fibrous and, in thinly rolled steel, of a laminated structure with distinct leaves overlapping each other. As corrosion takes place, these leaves or fibres scale off, constantly presenting a fresh surface to the corrosive agent. The manipulation or working of this metal in the process of its manufacture thus has unfitted it to form its own protective coating, as does cast iron.

Photomicrograph of cast iron, much enlarged, showing granular structure

Photomicrograph of wrought iron, much enlarged, showing fibrous structure



Drawing of a piece of sheet steel, much enlarged, showing surface and sectional structure with a typical pit

Solving pipe problems is the business of our Research Department. We welcome an opportunity to coöperate with pulp and paper mill operators.

Write for Illustrated Catalogue "P" Describing 2" Cast Iron Pipe

AMERICAN CAST IRON PIPE COMPANY

BIRMINGHAM, ALA.

DISTRICT OFFICES IN PRINCIPAL CITIES

This Austin operation is the Oswegatchie Paper Company plant now under construction at Gouverneur, N. Y.

Exterior of the Chillicothe Paper Company Plant at Chillicothe, Ohio, completely designed, built and equipped by The Austin Company

Finished Storage Building interior, the Richardson Company Plant. This Chicago plant was designed, built and equipped by The Austin Company

The following is a partial list of Austin clients in the paper, wood pulp and roofing industries:

Hammermill Paper Co., Erie, Pa.
Flintkote Company, Little Ferry, N. J.
Log Supply Co., Berthierville, Quebec.
H. F. Watson Co., Chicago, Ill.
A. P. W. Paper Company, Albany, N. Y.
Arrowhead Mills, Fulton, N. Y.
Bogota Paper and Board Co., Bogota, N. J.
Continental Fibre Co., Newark, Del.
Chillicothe Paper Co., Chillicothe, Ohio.
Hinde & Dauch Co., Sandusky, Ohio.
National Fibre and Insulation Co., Yorklyn, Del.
Peninsular Paper Co., Ypsilanti, Mich.
Richardson Co., Cincinnati, O., and Melrose Park, Ill.
Simplex Paper Corp., Palmyra, Mich.
West Carrollton Parchment Co., Dayton, Ohio
Oswegatchie Paper Co., Gouverneur, N. Y.
Ideal Corrugated Box Co., Parkersburg, W. Va.
Holyoke Gummed Products Co., Holyoke, Mass.
Algonquin Paper Co., Ogdensburg, N. Y.
The Jaite Company, Jaite, Ohio.

Several Austin Paper Mill Operations Now Under Way

During the last six months The Austin Company has been awarded a number of contracts by manufacturers in the paper industry. Many of them have been completed. Several are under way at the present time.

The new plant of the Oswegatchie Paper Co. at Watertown, N. Y., is now nearing completion.

A new plant building is now under construction for the Holyoke Gummed Products Co. at Holyoke, Mass.

For the Jaite Company at Jaite, Ohio, one plant unit is now under construction and the contract for another plant building has just been awarded to The Austin Company.

A new plant building and the remodeling of a number of old buildings is now under contract for the Algonquin Paper Co. at Ogdensburg, N. Y.

If you contemplate construction of any kind, Austin Engineers are prepared to furnish you with preliminary data, sketches, approximate costs or even exact costs that will help you to definitely decide upon your building program.

Phone, wire or use the coupon.

THE AUSTIN COMPANY, Cleveland
Engineers and Builders

New York	217 Broadway
Chicago	1374 Cont. and Com. Bank Bldg.
Cleveland	16112 Euclid Avenue
Detroit	1954 Penobscot Bldg.
Pittsburgh	Union Arcade Bldg.
Philadelphia	1026 Bulletin Bldg.
Dallas	627 Linz Bldg.
St. Louis	1794 Arcade Bldg.
Seattle	1301 L. C. Smith Bldg.
Birmingham	412 Jefferson Bank Bldg.
Los Angeles	The Austin Co. of California 702 Pacific Electric Bldg.
San Francisco	The Austin Company of Calif. 708 Sante Fe Bldg.

THE AUSTIN METHOD

AUSTIN

ENGINEERING BUILDING EQUIPMENT

P. I. 3-23

THE AUSTIN COMPANY, Cleveland, Ohio

We are interested in the erection of a ..... building ..... x ..... ft. ..... stories high, and would be pleased to receive a copy of the new edition of "The Austin Book of Buildings," without obligation.

☐ We are interested in branch plants and warehouses, and would appreciate receiving additional literature and information.

Firm.....

Individual.....

Address.....

"Hercules" Chain Conveyors handling Pulp wood

Wood Apron Conveyor handling Bales of Rags

Cable Conveyor and Pulp Wood Stacker

Flat and Round Steel Link Chain Conveyor handling straw

"Reliance" Chain Conveyor handling rolls of paper

"Tanktred" Type Portable Loader. Portable Belt Conveyors also furnished

Pivoted Bucket Carrier for handling coal and ashes

JEFFREY
MATERIAL HANDLING MACHINERY

HAS played an important part in the great expansion and development of the Pulp and Paper Industry. This has been made possible largely through more efficient producing and handling methods.

Jeffrey Standard Equipments cover every phase of handling, from the storing and stacking of the wood to the conveying of the finished pulp.

Pulp Wood Stackers; conveyors of various types; bucket elevators, chains, buckets, sprockets, coal and ashes handling systems, skip hoists, coal crushers, shredders, industrial locomotives, etc.

Profit by the more than 40 years of experience of Jeffrey Engineers, and let them help you to select the equipment which will meet your requirements at lowest cost

See Our Exhibit at Space No. 128, at the Paper Industries Exposition, New York City, Week of April the 9th.

The Jeffrey Manufacturing Co.

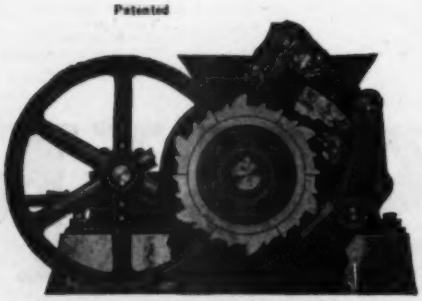
944-99 North Fourth Street, Columbus, Ohio

New York, 2908 Hudson Terminal Bldg. Chicago, 858 McCormick Bldg.
Pittsburgh, Rea Bldg., 622 2nd Ave. Montreal, Canada, Power Bldg.

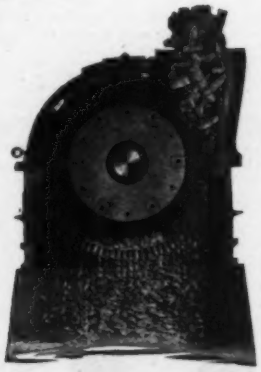
Locations of other Jeffrey Sales Representatives:

Detroit, 455 Book Bldg. Boston, 141 Milk St.
Milwaukee, M. & M. Bldg. St. Louis, 906 Pontiac Bldg.
Scranton, 518 Union Nat. Bank Bldg. Cleveland, 828 Nat. City Bank Bldg.
Charleston, W. Va., 614 Kanawha St. Denver, 1751 Wazee st.
Los Angeles, H. W. Hellman Bldg.

Patented



Single Roll Crusher for reducing coal to stoker sizes in one operation



Type "E" Swing Hammer Shredder for reducing Pulp Wood Chips

Hold Prices Firm—Don't Boost

THE ONE outstanding menace to the paper business this year is inflation.

The danger of inflation is very real right now.

We are blessed with an enlarged and increasing demand for paper.

Paper—an acknowledged essential commodity—is day after day in every way demonstrating its increasing value to the commercial and industrial world.

New paper fabrics, displacing cotton, linen and wood products, are making their appearance every week. More books are being written and printed than ever before. More advertising in magazines, newspapers, and by direct mail appeal than ever before in the history of the country, is being put out. More commodities are being produced, demanding more wrapping than ever known previously.

In the face of all these facts, registering a growing permanent demand of constantly greater volumes of paper, we have a curtailment of pulp production, and an advance in labor concurrently, with a resultant advance in prices of the finished paper products.

The Swedish strike is a further factor calculated to produce further price advances. No break in the lockout has occurred. No mill in all Sweden is turning a wheel or producing a pound of paper.

Now, paper prices are high enough for the present. Let there be no mistake about that. Since last October there has been an advance of over 80 per cent in mechanical pulp prices, and about 45 per cent in the chemical pulps. That's enough. They will not go higher, for spring is but thirty days away, and a plentitude of water will be available for mechanical wood production. Besides all that, the 80 per cent advance in ground wood pulp has been paid only by converter mills which make no pulp, or those mills on certain rivers where water was low and insufficient to keep grinders going. They will all be doing business merrily in thirty days, and the exorbitant pulp prices will yield.

But the labor advance is the one to watch. Further advances in prices of commodities which laborers buy, will certainly cause labor to ask for and obtain an advance in wages. Already certain mills, whose prices on paper produced were advanced, have been obliged to raise their wages, because the employees claimed that when wages were cut it was due to prices on paper being cut, and that now the mill was advancing its paper prices, it should advance wages also.

This is a pretty cogent argument—and a good one against advancing prices. But make no mistake, any attempt to artificially advance commodity prices, paper included, will result in an immediate demand for wage advances and then the same old vicious system will ensue; viz., advance in goods, followed by an advance in wages, then followed by another advance in goods and so on, until the inflated bubble bursts and deflation sets in for a couple of years or more, and dark blue ruin grips and grins grimly at all of us.

Avoid inflation as you would shun the plague. Wise manufacturers, merchants, bankers and labor leaders will all combine to keep business on an even keel. Good business, in larger volume, for some long time at a good profit, is right here with us now. Let's be sensible, just and satisfied to keep the status quo.

Hold present values steady. Don't boost prices.

The solution of the roof-drying problem . . . . . .

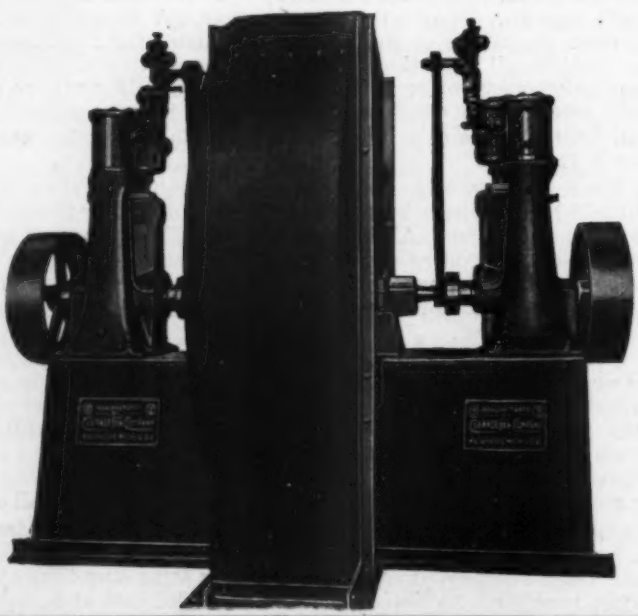
THE presence of excessive amounts of water vapor in the machine room has always troubled paper manufacturers. In addition to promoting rapid decay of the roof, the vapor after condensation, drips down onto the paper in manufacture. Spots in the paper—lowering quality—and frequent tearing, with a production loss, result.

The installation of Clarage Roof-Drying Systems has solved this problem for many paper makers. Warm dry air is supplied at the roof line; excess water vapor is removed. The Bryant Paper Co. of Kalamazoo, Michigan, says that the system installed at their plant has done more than guaranteed.

Clarage-Kalamazoo fan equipment is solving many of the problems of paper-making; hundreds are in use for heating and ventilating, for conveying paper stock and for supplying mechanical draft.

If you wish, you may have the bulletins describing Clarage-Kalamazoo equipment. We'll include the bulletin telling the story of the Clarage Type V Vertical Engine if you wish.

Clarage Fan Co., Kalamazoo, Michigan

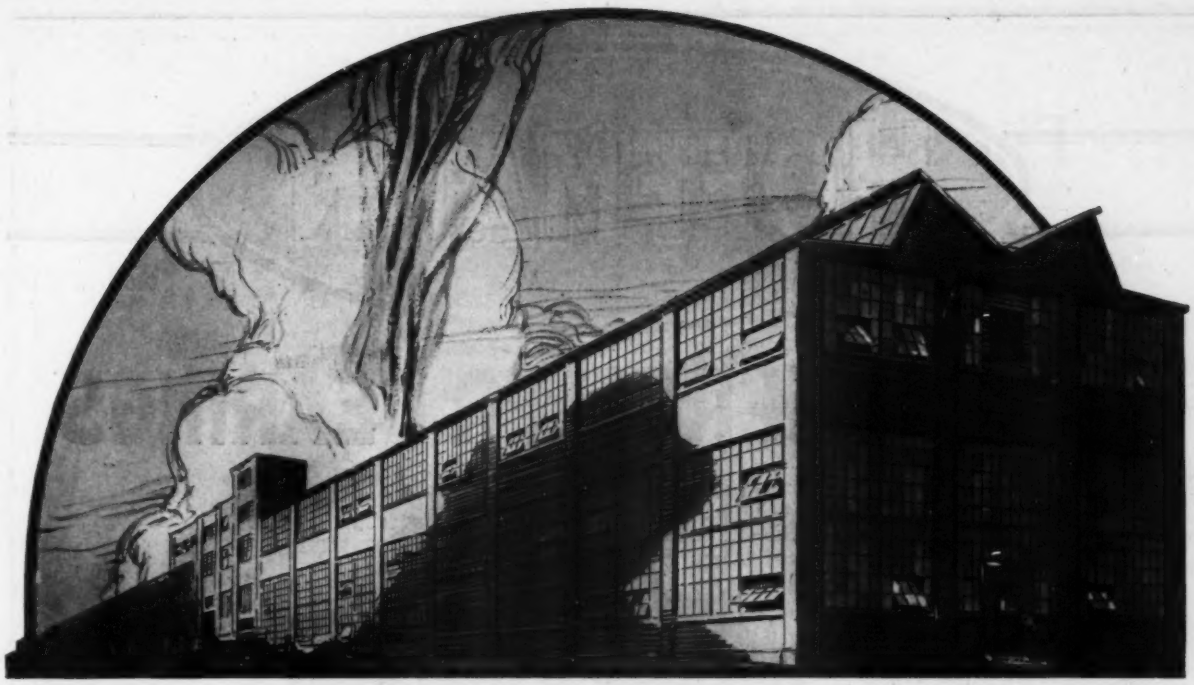


Clarage - Kalamazoo Forced Draft Fan direct-connected to a Clarage Type V Engine—the unfailing combination for paper mills. One of the engines shown is not connected to the fan but is merely held in reserve.

BRANCH OFFICES
New York City
Indianapolis
Cleveland
Chicago
Pittsburgh
Minneapolis
Los Angeles
Detroit
Philadelphia
Rochester, N. Y.
New England Elec. Equip. Co., Boston, Mass.

CLARAGE —KALAMAZOO FANS

BLOWERS
EXHAUSTERS
ENGINES



Certainty vs. Uncertainty as to Final Cost

"ONCE bitten, twice shy" explains many a manufacturer's views right now on factory construction. To himself he admits his need for more space. His associates have pointed out the added profits to be gained from increased production. But still he hesitates——afraid to start something which may cost him more than anticipated. He has bitter memories of his last construction venture.

The solution of his problem is the FERGUSON METHOD—absolute protection from start to finish because

(1) Cost is fixed in advance AND GUARANTEED.
(2) Quality is specified in advance AND GUARANTEED.
(3) An exact date of delivery IS GUARANTEED.

And furthermore, his own time is effectively protected because he deals only with ONE firm which then assumes the whole responsibility for design, construction (main and sub-contracts) and equipment.

Write, wire or phone today—either for descriptive illustrated handbook of the Ferguson Method or a personal interview (no obligation).

The illustration above shows the Fort Madison, Iowa, plant of The Hinde & Dauch Paper Co.—a 650-ft. building designed and erected by The H. K. Ferguson Co.

THE H. K. FERGUSON COMPANY

Design and Construction of Heavy Industrial and Railroad Projects

HAROLD K. FERGUSON, President

6523 Euclid Avenue CLEVELAND Phone Randolph 6854

Ferguson

ONE OF AMERICA'S BEST BUILDERS

HOFFMANN

PRECISION ROLLER BEARINGS

Heavy-duty units built to the highest standards of precision; affording maximum serviceability under conditions involving heavy loads, shocks, jars and vibrations; opening up new avenues to power saving and reduced up-keep costs; built in both standard and self-aligning types.

Our engineers will welcome an opportunity to work with yours, in the application of these high-duty, high-precision bearings to paper making machinery with a view to securing maximum anti-friction efficiency, minimum maintenance costs, and continuity of service.

THE NORMA COMPANY OF AMERICA

Anable Avenue Long Island City New York

MANUFACTURERS OF "NORMA" PRECISION BALL BEARINGS

Two Heads Are Better Than One

IN A RECENT issue of "T-W-S News," an employees' house organ published by the Thilmany Pulp & Paper Company of Kaukauna, Wis., appears the following announcement:

"WHAT WOULD YOU DO?

"If you were president of this company, desirous of making this the best possible paper mill to work in, and bearing in mind that the business must make a profit or close down, what would you do? How would you make conditions better?

"Write your answers to the editor and sign them. The editor will treat them as confidential. Be honest and write just what you think—but be sure you think. Maybe you have the answer. Here is your chance."

As a keen, progressive industry we must get away from the idea that a working organization is wholly incapable of anything aside from routine work. It is more than a mere machine. The idea that the most efficient laborer is one with a strong back and a weak mind was junked long ago.

A man's a man whether he wears denim or serge and being a man he is made with at least a limited capacity for thinking. A wise management, realizing this fact, will go a long way to cash in on the tremendous possibilities of the gray matter in its working organization.

In many mills there are suggestion boxes placed at various points throughout the plant. In other mills regular printed forms are distributed to the workers on which they can jot down any suggestion they may have to make. The big thing, however, is not the system employed to solicit suggestions from employees. It is, rather, the sincerity of the management to receive and make use of its workers' ideas in a way that will react to the benefit of both management and employee.

Two heads are better than one!

Simply a Matter of Placement

THE FELLOW who filled his pipe with dynamite and then lit it did not prove that dynamite has no place in the progress of the world. He simply proved that he used poor judgment in making use of it.

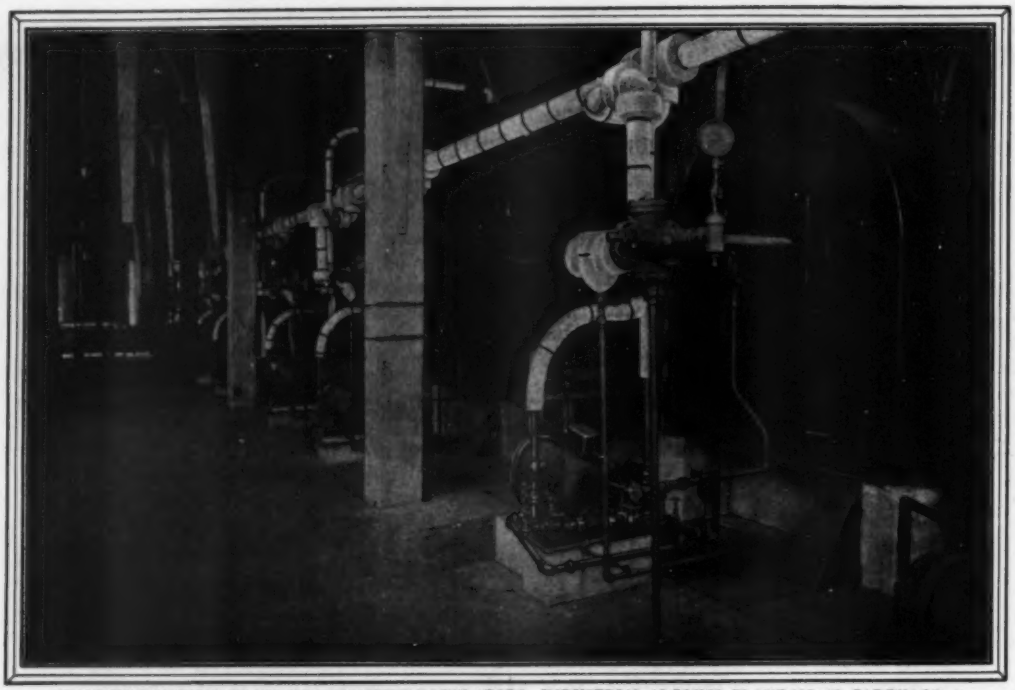
The company which let a cost man come in and entirely reorganize and change its business policies to such an extent that it had to go out of business did not prove that cost men were total liabilities. It simply showed poor judgment in making use of the cost man.

the past few years. There is undoubtedly a great, potential industrial world, is more than a fad. He is more than a luxury. He is an asset to a business, and not a liability. We make these statements in spite of the fact that cost systems and cost men have played havoc in some mills during the past few years. There is undoubtedly a great potential industrial power in cost systems and the men who work them, but like the power in dynamite it must be carefully handled.

Perhaps one of the greatest mistakes a cost man makes is the idea that a thorough knowledge of figures and charts is his only requirement.

As we write this we have in mind a man who has made a failure of the cost system in a large paper mill. This man is a good bookkeeper. In handling systems he is hard to beat. He fell down on the cost system, however, because he knew more about figures and systems than he did about paper and the raw materials that constitute it, and most of all, he had not learned to co-operate with the superintendents and foremen for their mutual benefit. A man who operates a system that is to be of value to his company must be intimate with the vitals of that company, namely, the manufacturing end.

A cost system should be to an industry what a thermostat is to a heating system—simply a regulator. But in order to function properly, they both must be in the heat of things and do their indicating from first hand and authentic information.



CRANETILT LIFTING TRAPS AND PRESSURE REGULATORS. INDUSTRIAL ALCOHOL PLANT NO. 19, CARTHAGE, O.

TO SIMPLIFY YOUR OPERATING PROBLEMS

Automatic devices particularly adapted for your piping requirements can be used to simplify many problems. Pressure regulators, as an example, can be adjusted to deliver steam or air at a lower pressure direct from high pressure mains. Steam traps of the lifting type will receive any condensation from lines under low pressures or vacuum and discharge into a direct return trap which feeds this hot condensation into the boilers under full boiler working pressure. A wide range of automatic devices as well as of valves and fittings, designed for any working pressure and temperature or for use with corrosive elements, is supplied by Crane Co.

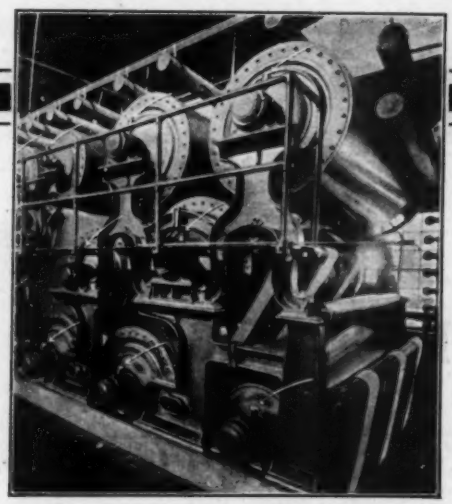
CRANE

GENERAL OFFICES: CRANE BUILDING, 836 S. MICHIGAN AVE., CHICAGO

Branches and Sales Offices in One Hundred and Thirty-five Cities
National Exhibit Rooms: Chicago, New York, Atlantic City
Works: Chicago and Bridgeport

CRANE, LIMITED, MONTREAL. CRANE-BENNETT, LTD., LONDON
CRANE EXPORT CORPORATION: NEW YORK, SAN FRANCISCO
CIE CRANE, PARIS

Crane Low Pressure Gate Valve, No. 449½



Dryer Rolls lubricated with Keyso Grease (Venango System)

For Machinery Operating Under High Heat Conditions

THE correct lubrication of various types of machinery operating under abnormally high radiated heat conditions has long been a problem to plant superintendents. Dryer roll bearings in paper mills could be cited as a good example.

Keystone-Keyso

High Melting Point Grease

like all other Keystone Products, is a pure grease scientifically manufactured from high-grade petroleum oils. By combining high heat-resisting properties with high lubricating and friction-reducing value it invariably results in decreased production costs to manufacturers and eliminates shut-downs due to incorrect lubrication.

Keystone-Keyso Grease is made in 6 densities—Nos. 40, 41, 42 and 43 for open well boxes; Nos. 44 and 45 for Keystone Hand Compression and Spring Automatic Grease Cups.

Send for Booklet describing Keystone-Keyso High Melting Point Greases.

THE KEYSTONE LUBRICATING CO.

New York
Boston
Pittsburgh
Chicago
Detroit
Omaha
St. Louis

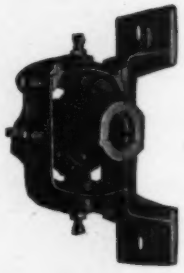
Executive Office and Works:
Philadelphia, Pa.
Established 1884

Denver
San Francisco
Minneapolis
Montgomery, W. Va.
Kansas City
Memphis
Tulsa, Okla.

Agencies in Principal Countries Throughout the World

KEYSO
TRADE MARK
REG. U.S. PAT. OFF.
GREASE

CLEVELAND TYPE
HILL COLLAR OILING BEARING
(Patented)

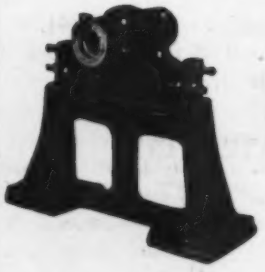


Such universal satisfactory service has been obtained from our Standard Type Hill Collar Oiling Bearing that it would be hard to convince many of our customers that any other design could be superior.

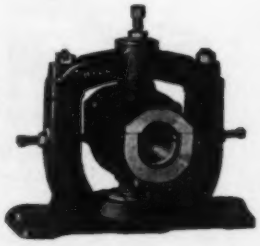
Since placing upon the market, several years ago, the new Cleveland Type we have manufactured both designs, leaving it to our customers to decide which they preferred. After several years our experience, and that of our customers, has demonstrated that the Cleveland Type is the better and more popular line.

The mountings have all been re-designed and contain many improvements, the natural results of an accumulated experience of thirty-nine years.

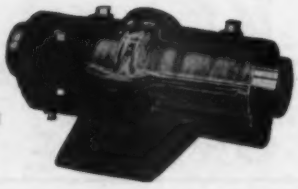
Although we appreciate that there are some who would say that it is not good business judgment to disturb a satisfied customer, our experience after manufacturing both types for many years has been such that we recommend the Cleveland Type, not only to new customers, but also to our old customers who have been obtaining most satisfactory service from our older Standard Type Bearing.



EFFICIENT DURABLE ECONOMICAL



THE HILL CLUTCH CO.



GENERAL OFFICES AND PLANT
Cleveland, Ohio

NEW YORK OFFICE
50 Church St.

A Good Many "Tuned In"

THE suggestion to broadcast a message on waste, which was made by the paper mill superintendents of Michigan and carried out by THE PAPER INDUSTRY, is soliciting a volume of response which had scarcely been hoped for. Newspapers all over the country are pointing out the potential value in waste paper of all kinds. A number of radio stations have broadcasted the article prepared thereon by THE PAPER INDUSTRY, and all indications are to the effect that the paper-consuming and the paper-wasting public is taking a new interest in paper and forest conservation.

Extracts of THE PAPER INDUSTRY's article on Paper, which was heard over the radio by thousands, are given below:

"How careless we have become in our appreciation of the advantages offered to us by the use of this commodity which is woven so tightly into every minute of our existence! And how regardless we are of what becomes of this paper after it has performed its particular mission, either in the form of our daily newspaper, the magazine, advertising circular or box containing our breakfast food! . . .

"From the earliest known date when paper was manufactured from fibrous material until the middle of the Nineteenth century, it was made from rags of linen and cotton. The Chinese are credited with having originated the process two centuries or more before the Christian era. From them the Arabs acquired the art, and manuscripts are preserved to this day on paper made by them from the flax plant. European paper making was introduced by the Moors in Spain in the middle of the Twelfth century, and one hundred years later the great center of the industry was established in Italy. England began making paper in the Fourteenth century and Queen Elizabeth caused John Spilman to be knighted for succeeding in making a superior quality of writing paper for the use of Her Majesty. . . . The paper making machine came into the early history of the industry in the United States.

"The healthy demand of a fast growing nation for increasing supplies of paper on which to print newspapers and books taxed the resources of a timber laden country. We were unmindful of the devastation until a half of our original timber wealth had been consumed and destroyed, and now there is left but a bare 40 per cent. We are at the present time using timber at a rate four times as fast as we are growing it.

"Last year, the public returned to the mills 2,000,000 tons of waste paper. Five million tons have not been accounted for. Allowing that 60 per cent of this is preserved in the form of books and other permanent records, there is still some 2,000,000 tons which are undoubtedly being carelessly destroyed. The public by wantonly wasting 2,000,000 tons of the paper it received is causing over 300,000 acres of good, clean pulpwood to be consumed which otherwise could be saved. Remember that every six tons of waste paper collected means the preservation of about one acre of pulpwood forest.

"As the consumption of paper is nearest the centers of commerce and industry, the fast receding forests from these centers has made it necessary to transport timber, or pulp, or manufactured paper, over constantly increasing distances. The steadily increasing transportation costs and the consequent increasing price of paper is making a problem which strikes directly at the source of our national strength.

"This magazine, THE PAPER INDUSTRY, has joined hands with the paper mill superintendents of the State of Michigan in a co-operative movement to conserve waste paper. We believe it to be a patriotic duty to make every effort to prevent this waste and revert it back to the paper mills.

"We recommend that you preserve the fibre of which paper is made. Extend the movement to your public schools, and with these buildings as centers for collection let the children be collectors.

"In certain localities, small clubs and organizations are making the practice of collecting their waste paper. They are thereby assisting in the preservation of our forests and at the same time indulging in the practice of thrift. Anyone with a sincere desire to save can find ways of doing so. This will give the forests a chance to come back.

"The president of the Book Paper Manufacturers Association recently remarked: 'Today the housewife is able to get a reasonable price for her waste paper. The lack of a steady market, however, causes tremendous waste. Today waste paper is so scarce that it costs the paper manufacturer in some regions more than new pulp wood. Paper has been so cheap that no junk dealer would buy it. The shortage followed, and now it is too high.

"'As a means of forest conservation, if for no other reason, the public and the paper industry should cooperate to save old papers on a basis which would mean a steady supply to the mills and a reasonable price year in and year out to those who in slack times are forced to pay to have their old paper hauled away.'"

The point has now been suggested by certain paper mill men that since the public is getting onto the job and saving their waste paper, it is up to the paper mills and paper stock dealers to make this essential conservation worth while to those who are eager to do their part to conserve the forests of the country.

The public is willing and anxious to save their waste paper; is the paper industry going to do its part and make it worth while?

We were PIONEERS in making
OSCILLATING, NON-SCORING
FOURDRINIER WIRES

This is one reason why
"Appleton Wires Are Good Wires"

Fourdrinier Wires
Cylinder Wires
Washer Wires
Of brass or bronze

APPLETON WIRE WORKS
Appleton, Wis., U. S. A.

KENWOOD

WOOL PRODUCTS

KENWOOD IMPROVED TAN JACKETS

A softer, more resilient surface—shrinks back more tightly, hugs the roll more firmly—is not inclined to creep or lump—permits change of deckle out or in—removes more water—is woven in strata or layers and may be worn away to the last layer without endangering wires. Gives

LONGER SERVICE—DRIER SHEETS—LEAST TROUBLE

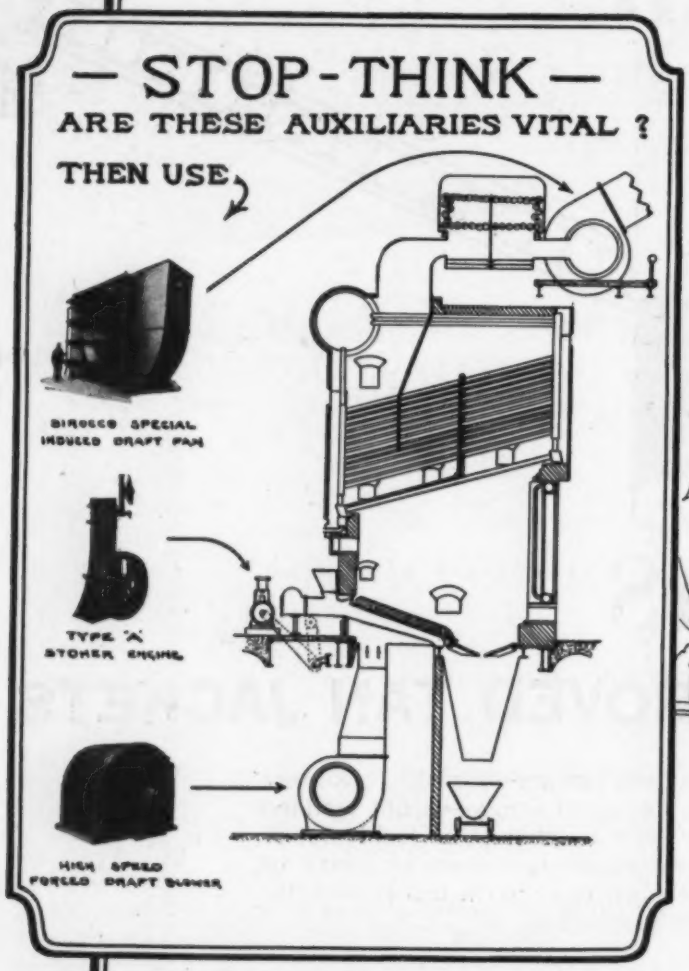
The word "TAN" means that the jacket has been treated by a special patented process based on tanning processes, which makes the jacket stronger, more resistant to friction and abrasion and to the action of water and chemicals.

F. C. HUYCK & SONS

Kenwood Mills, Albany, N. Y.
Kenwood Mills Ltd., Arnprior, Ontario, Canada

Kenwood Mills, Albany, N. Y.

Kenwood Mills Ltd., Arnprior, Ontario, Canada


— STOP-THINK —
ARE THESE AUXILIARIES VITAL ?
THEN USE
SIROCCO SPECIAL INDUCED DRAFT FAN
TYPE 'A' STOKER ENGINE
HIGH SPEED FORCED DRAFT BLOWER

Vital Factors in Mechanical Draft Systems

In the application of mechanical draft apparatus, the proper selection of the blowing equipment to meet the individual demands of the plant it serves, is second only to operating reliability. Control of capacity, pressure and speed, method of drive, economy of operation, etc., are a few of the factors which must be considered.

The wide use of American Blower mechanical draft apparatus is due largely to the fact that there is American Blower equipment of rugged design and maximum efficiency for every requirement. This, with definite and accurate knowledge of its performance, enables American Blower engineers to cooperate with you in the efficient solution of any problem involved in mechanical draft installations.

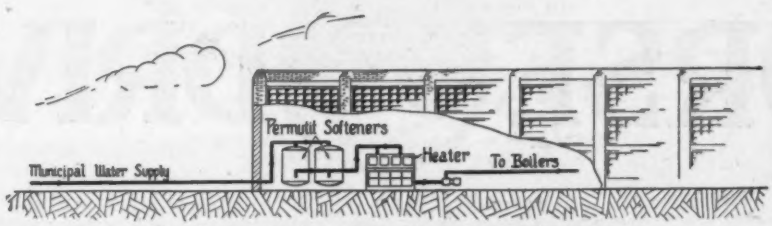
Bulletins describing American Blower equipment, its mechanical superiority, and its application, will be sent you on request.

AMERICAN BLOWER COMPANY, DETROIT
BRANCH OFFICES IN ALL PRINCIPAL CITIES
CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONTARIO (232)

American Blower

"Sirocco" TRADE MARK

EXHAUSTERS · VENTILATING FANS · AIR WASHERS · BLOWERS · ENGINES
FOR HEATING, VENTILATING, DRYING, AIR CONDITIONING, MECHANICAL DRAFT



Flow diagram showing water supply system described below

No Boiler Cleaning or Repairs in 750 H.P. Boiler Plant

A public service corporation in Salt Lake City, Utah, operates three Wickes, vertical water tube boilers that deliver 750 H. P. at normal rating. For boiler feed water they use the city supply which is derived from mountain streams, and contains variable amounts of hardness according to the weather and season. The average is about 14 grains per gallon.

For many years much trouble was experienced in this boiler plant due to scale that continuously deposited in boiler tubes, feed water heater, feed pumps and feed water lines. A cleaning gang was kept constantly at work and the entire plant operation was difficult and unsatisfactory.

A Permutit engineer was finally consulted and after a thorough investigation, a Permutit Zeolite water softener was installed in September, 1920, to remove absolutely all scale, sludge and mud forming impurities from the 35,000 gallons of boiler feed makeup water daily.

The results have been very gratifying. All scale troubles have disappeared completely, the cleaning gang has been laid off, and considerable money has been saved in fuel, repairs and tube replacements. A recent letter from the Manager stated in part:

> "Before installing Permutit Equipment at our gas plant, we were experiencing considerable difficulty throughout our entire boiler plant from scale, including feed water heater, feed pump, and feed lines. . . . . at the present time no scale trouble is experienced . . . . our former boiler repairs were necessarily heavy, and at the present time, the only repairs necessary to make is that of removing a thin tube occasionally."

We manufacture all types of equipment for rendering water clean and soft, and our experience with hundreds of firms like the above has given us some very valuable data, much of which has been recently published in our booklet "Reducing Fuel and Boiler Plant Operating Costs." Let us send you a free copy.

The Permutit Company
440 Fourth Ave. New York

For Your Protection

On June 15, 1921, the Federal Court at Buffalo (Hazel, J.) handed down a decision sustaining our patent covering zeolite water softening apparatus, and stating that this patent "is not limited to any particular class of zeolitic material." The Court also described the apparatus held to infringe, and this description, our counsel advises, applies to all zeolite softeners on the market. Other suits brought by us for infringement are pending.

The above decision has been affirmed by the Circuit Court of Appeals, and the U. S. Supreme Court has denied a petition for a writ of Certiorari to review it.

Send for this free booklet

The Permutit Company
440 Fourth Ave.
New York

Please send me your free booklet, "Reducing Fuel and Boiler Plant Operating Costs."

Name _____

Address _____

Company _____

The Sign of Efficiency

MORSE DRIVES

The Sign of Durability

THE MORSE "ROCKER JOINT"

Positive as Gears

Flexible as a Belt

Longer Life

Fifteen Morse Silent Chain Drives in Congoleum Company Mill

The illustration shows one of the fifteen Morse Silent Chain Drives in the mill of the Congoleum Company, Asbestos, Maryland, driving a Jordan engine from a 150 H.P. motor on felt stock, one of the hardest kinds of stock to refine.

This mill uses the following Morse Chain Drives:—one 150 H.P.; four 100 H.P.; nine 90 H.P.; one 75 H.P.; all doing splendid work.

Morse Chains are 99% efficient, silent, durable and economical to maintain.

Where you have unusual and hard conditions from wear and exposure, Morse Silent Chains prove their greatest worth.

For driving Jordan engines, beating engines, paper machine line shafts, and for many other places in the paper mill, the ideal drive is the Morse Silent Chain.

MORSE CHAIN CO., LARGEST MANUFACTURERS OF SILENT CHAINS IN THE WORLD **ITHACA, N. Y.**

Write today for booklet

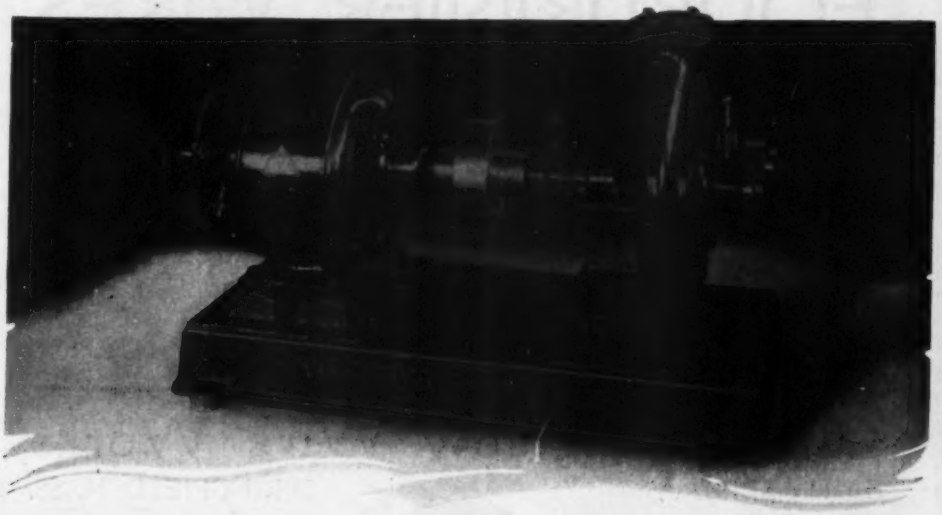
Morse Engineering Service BENEFIT BY MORSE SERVICE AS OTHERS DO *Assistance Without Obligation*

Address Nearest Office

ATLANTA, GA.....Chandler Bldg., Earl F. Scott & Co.
BALTIMORE, MD.....1402 Lexington Bldg.
BOSTON, MASS.....141 Milk Street
CHARLOTTE, N. C.....404 Commercial Bank Bldg.
CHICAGO, ILL.....Merchants L. & T. Bldg.
CLEVELAND, OHIO.....Engineers Bldg.
DETROIT, MICH.....1341 Abbott Street
KANSAS CITY, MO.....Finance Bldg., Morse Eng'rg Co.
NEW YORK CITY.....30 Church Street
MINNEAPOLIS, MINN.....So. 3rd St., Strong-Scott Mfg. Co.
MONTREAL.....St. Nicholas Bldg., Jones & Glassco Reg'd
PHILADELPHIA, PA.....Fuller Bldg.
PITTSBURGH, PA.....Westinghouse Bldg.
SAN FRANCISCO, CAL.....Monadnock Bldg.
ST. LOUIS, MO.....Chemical Bldg., Morse Eng'rg Co.
TORONTO.....Bank of Hamilton Bldg., Jones & Glassco Reg'd
WINNIPEG, MAN.....Dufferin St., Strong-Scott Mfg. Co.

"Morse" is the Guarantee Always Behind the Efficiency, Durability and Service

SKF



Ball Bearings on Centrifugal Pumps
Eliminate Lubrication Troubles and Bearing Wear

LUBRICATION trouble and bearing wear are the predominant difficulties in centrifugal pumps. Because of the relatively high speed under heavy load, it is practically impossible to maintain the oil film upon which sleeve types of bearings and plain thrust collars depend for their proper functioning.

Furthermore, plain bearings are rigid, which makes it impossible for them to yield to the continual slight deflection of the shaft with the result that the hard shaft cuts into the softer bushings and ultimately destroys them.

SKF marked self-aligning radial and thrust ball bearings prevent these troubles as they possess the exclusive inherent ability of automatically compensating for shaft deflections. Furthermore, lubrication troubles are not experienced as the lubricant is not used for load-carrying purposes but chiefly to prevent corrosion.

Obtain these advantages and at the same time save power and eliminate needless shutdowns by specifying ball bearing equipment.

THE SKAYEF BALL BEARING COMPANY

Supervised by **SKF** INDUSTRIES, INC., 165 Broadway, New York City

911

Normal View *Deflected View*

BALL BEARINGS
The Highest Expression of the Bearing Principle

FOURDRINIER WIRES

Dandy Rolls *Cylinder Molds*

Brass, Copper and Iron Cloth

Bank and Office Railings

WIRE SIGNS

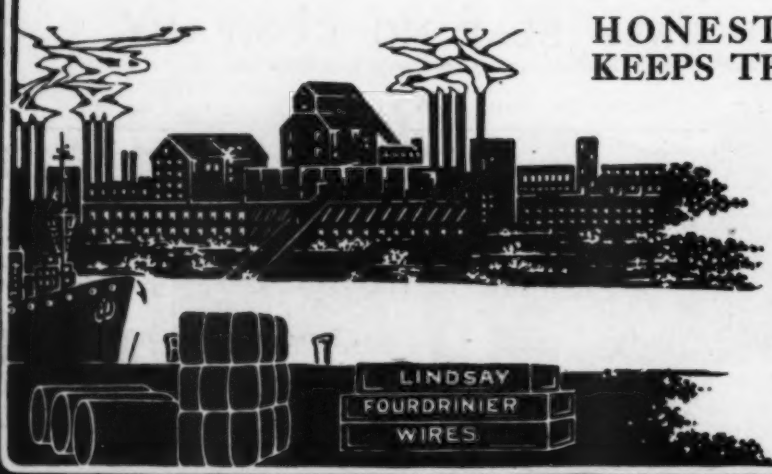
Cheney Bigelow Wire Works

Established 1842 SPRINGFIELD, MASS.

Real Merit Placed

Lindsay Fourdrinier Wires

In Many Mills



HONEST SERVICE KEEPS THEM THERE

They are ready to serve you

The Lindsay Wire Weaving Company

Collinwood Sta., Cleveland, Ohio

"Ask any Papermaker"

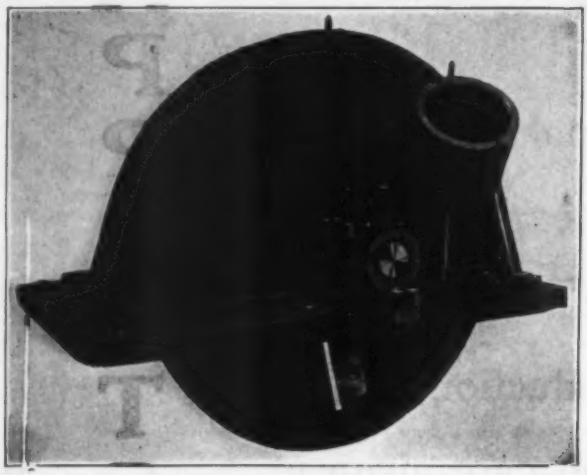
Wisconsin wires
I n all meshes
S uitable for paper making purposes
C arefully woven by experts only
O n most modern looms, built
N ot for greatest production, but with
S pecial attention and care given
I n construction of these machines to
N eed of "Quality first."

APPLETON WISCONSIN

Wisconsin wires
I ncrease your tonnage
R educe your costs, and
E nlarge your profits.

Wisconsin wires
O f highest quality,
R emarkable life,
K eep their alignment, and have
S eams that neither mark nor break.

Pulp and Paper Mill Machinery



Chippers

That produce clean, evenly cut chips, free from slivers.

Our patented improvements make this possible.

Made in
48", 84", 90" Sizes

Right or Left Hand
Three or Four Knives

Description on Request

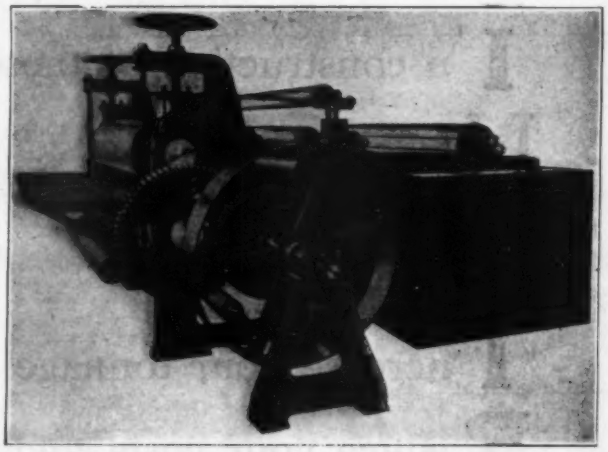
We manufacture
Wet Machines
that give satisfaction

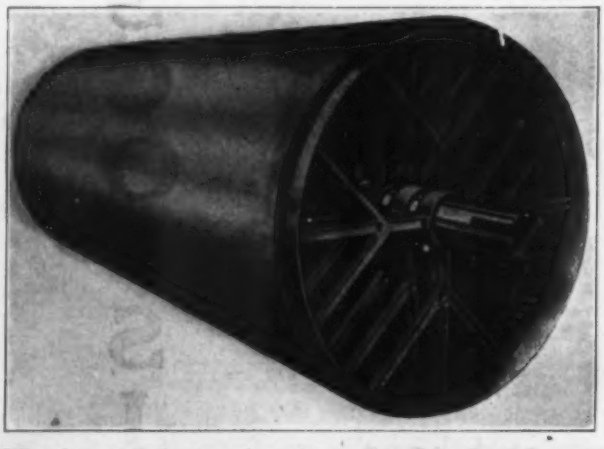
Single Cylinder
Double Cylinder

Any width face or diameter mould.

We also make a combination wet machine and decker.

Particulars on Request





Cylinder Moulds

Made on our special machinery—will stand long wear.

Hand sewed covers—Removable end Clamping Rings

Give a smooth surface, therefore a longer life to your felt.

Satisfaction Guaranteed

We also manufacture the "WOLF (Patented) MOULD."

We also manufacture 3 and 4 pocket Grinders, Screens, Barkers, Pumps, Iron, Brass, Bronze and Lead Castings

UNION IRON WORKS Bangor, Maine

DOWNINGTOWN

High Speed Fourdriniers
Fourdrinier Machines
Cylinder Machines
Vulcanized Fibre Machines
Container Board Machines
Wall Board Machines
Ready Roofing Machines

DOWNINGTOWN PRODUCTS

Pasting Machines
Saturating Machines
Pulp Drying Machines
Creping Machines
Sheet and Mill Liners
Wood Tub Beating Engines
Iron Tub Beating Engines
Cyclone (fast) Beating Engines
Duplex Beating Engines
Bandless Beater Rolls
Fly Bars and Bed Plates
Cylinder Washers
Washing Engines
Mixing Engines
Bleaching Engines
Cooking Engines
Cotton Washing Engines

Single Stuff Pumps
Duplex Stuff Pumps
Triplex Stuff Pumps
Stock Fan Pumps
Centrifugal Water Pumps
Suction Pumps
Diaphragm Screens
Shaft and Drum Winders
Tissue Drum Winders
Board Winders
Reels and Unwinders
Collapsible Reels
Collapsible Winder Shafts
Single Cutters
Duplex Cutters
Wall Board Cutters

Single Slitters
Duplex Slitters
Revolving Slitters
Press Rolls (Rubber, Gun Metal and Stone)
Smoothing Roll Stacks
Safety Dryer Steam Joints
Stuff Chests (Horizontal and Vertical)
Stuff Chest Agitators
Mixing Tanks (Wood and Iron)
Lime Tanks
Felt Washing Machine
Suction Boxes (Wood or Metal)

Suction Box Covers (Maple)
Calenders, Rolls and Stands
Board Calenders
Revolving Save Alls
Gate Valves
Wet Machines
Cylinder Moulds
Couch Rolls
Felt Stretchers, Guides
Shafting, Pulleys, Hangers
Gears (Cast, Cut and Mortise Filled)
Felt Rolls (Wood, Iron, Brass & Copper Covered)
Felt Roll Brackets (Bronze Bushed) (Ball Bearing)

Requests for information or quotations are always honoured without delay

DOWNINGTOWN MANUFACTURING COMPANY

Paper and Pulp Mill Machinery

P. O. BOX 8, EAST DOWNINGTOWN, PA., U. S. A.

UNION SULPHUR

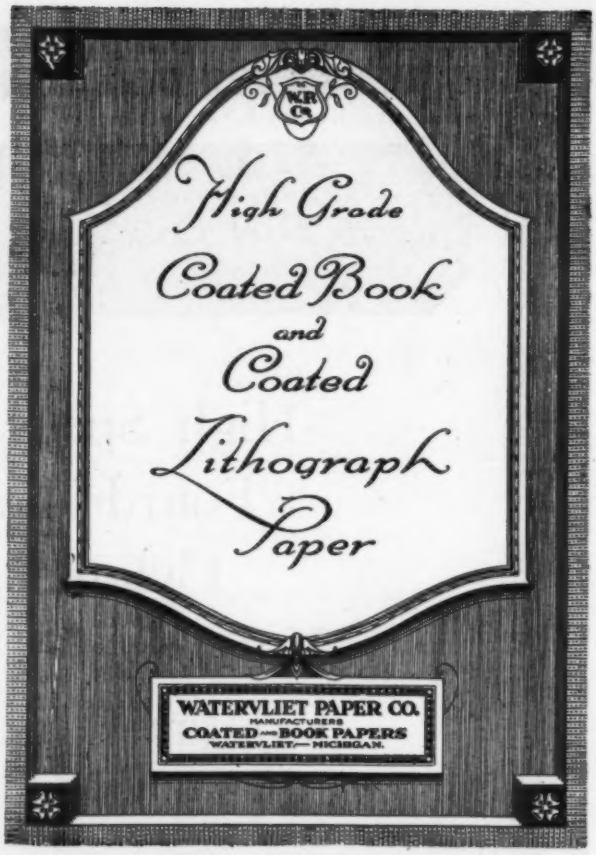
The Best for Better Sulphite Pulp

Guaranteed 99½ Per Cent Sulphur
Combined with 100 Per Cent Service

Substantial warehouse stocks always maintained at strategically located seaboard stations insure

Prompt Delivery Against All Orders

The Union Sulphur Company
Frasch Bldg., 33 Rector St., New York, N. Y.



MUNISING PAPER COMPANY

MUNISING MICHIGAN

MANUFACTURERS OF

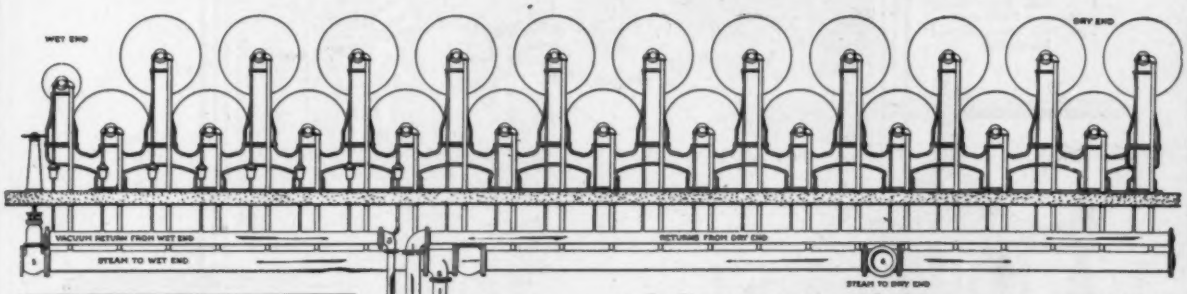
MUNISING M BOND

COLOR QUALITY AND UNIFORMITY
HAVE MADE FOR IT
AN ENVIABLE REPUTATION

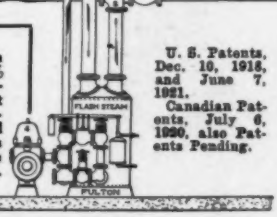
The FULTON Forced Vapor Circulator

KEEPS ALL WATER OUT OF DRYERS

Reduces Fuel Consumption—Increases Production



On installations of the Fulton Vapor circulator we guarantee 96% *steam temperature in paper machine dryers* and no water present in the dryers at any time. Complete payment is not required until purchaser is satisfied equipment is as represented. Your cost will be less and your production greater.



U. S. Patents, Dec. 10, 1918, and June 7, 1921. Canadian Patents, July 6, 1920, also Patents Pending.

THE FULTON FORCED VAPOR CIRCULATOR

The operation and the principle of this system is not in the least complicated. It is, on the other hand, extremely simple as will be readily noted by means of the accompanying drawing. An explanation to this drawing is given briefly in the following:

1.—Return from dry end and steam supply to wet end.

2.—Steam to wet end.

3.—Vacuum return from wet end to pump.

4.—Vacuum pump. Steam or electric pump may be used.

5.—Valve through which air is blown when starting the machine after a period of shut down. **Maximum dryer temperature is thus obtained in fifteen minutes.**

6.—Steam supply to dryers.

Steam pumps 100% efficient by exhausting into the wet end dryers, therefore the cost of removing air and water from the dryers is practically nothing.

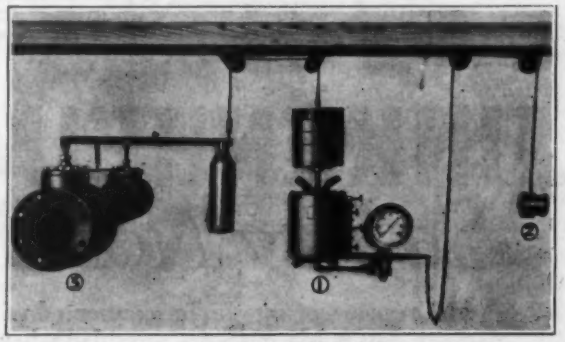
With this system practically 75% of the dryers constitute the dry end of the paper machine. By drying paper with less steam or vacuum on wet end gives a wider, stronger and better finished sheet and prevents cockling. Vacuum on wet end allows operation of steam at zero pressure or vacuum and no water in dryers.

All return water from heating coils in the mill can be piped to the Fulton Vapor Circulator and returned to the boilers with water of condensate from paper machine. No additional cost. No traps. Insures 100% coil efficiency.

It is not necessary to stop production while installing the Fulton Circulator since there are only three connections necessary, 1, 2 and 3.

DEMON STEAM PRESSURE REGULATOR

It is impossible to waste steam where the Demon Regulator is on the job. It stands as an ever alert watch over your coal pile. It also insures perfect steam regulation, for the live steam in inlet and exhaust valves is controlled by the pilot cylinder—1.



U. S. PAT. MAY 2, 1922

The remote control is placed on front side of paper machine—2. One operation of this controls incoming steam and exhaust.

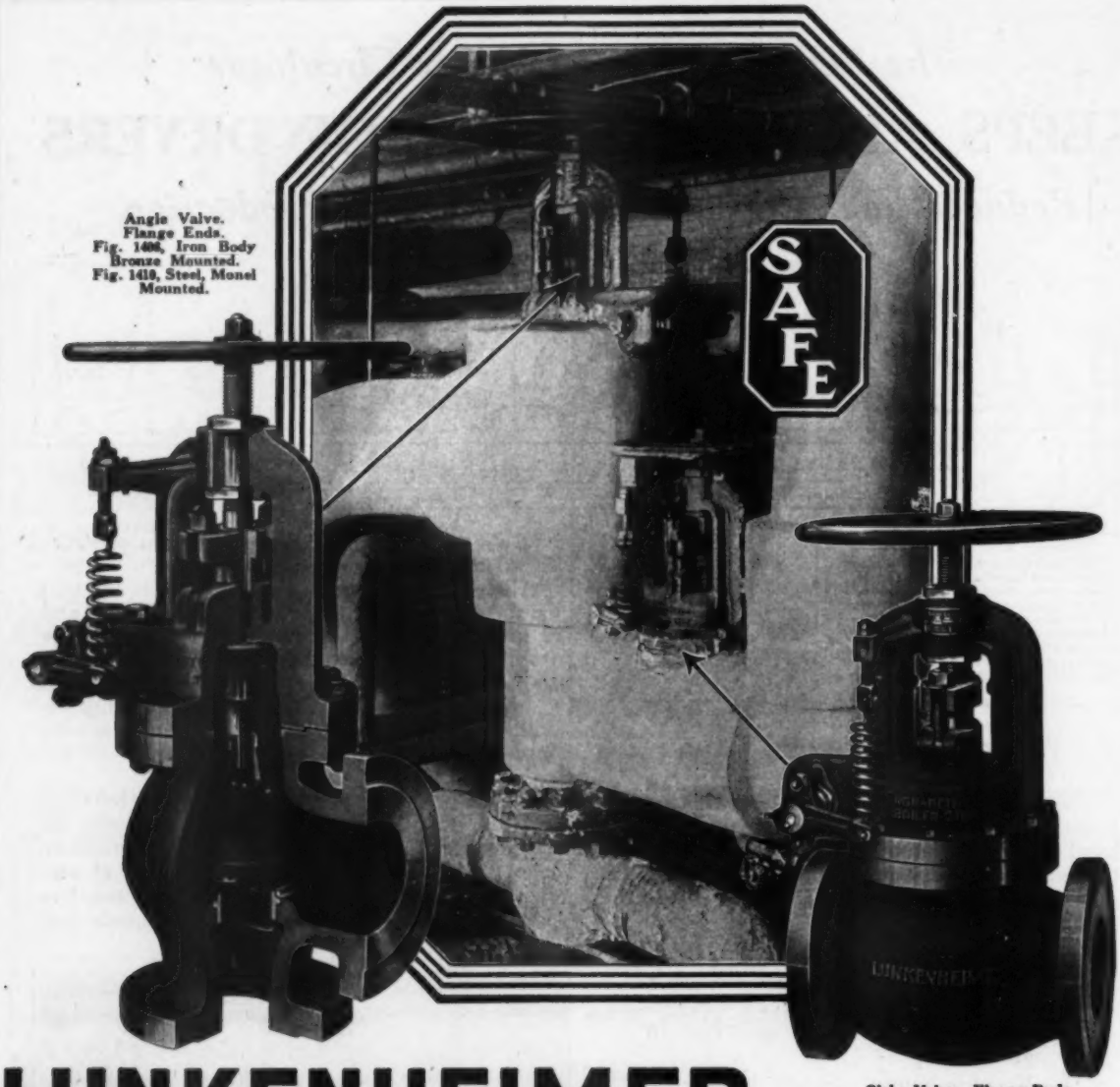
Where this regulator is used, master valves are placed in the steam lines—3.

The Demon Steam Pressure Regulator is built in all sizes and for all pressures.

Why not ask us what we can do for your machine—it costs nothing

The FULTON ENGINEERING COMPANY

MIDDLETOWN, OHIO



Angle Valve.
Flange Ends.
Fig. 1408, Iron Body
Bronze Mounted.
Fig. 1410, Steel, Monel
Mounted.

Globe Valve. Flange Ends.
Fig. 1407, Iron Body Bronze
Mounted.
Fig. 1409, Steel, Monel Mounted

LUNKENHEIMER

Safety Non-Return Valves

The rupture of one boiler connected with others in battery may cause considerable damage, but if MEANS are provided whereby pressure from the other boilers is instantly prevented from escaping through the ruptured one, not only is further damage avoided but the operation of the plant, through the medium of the live boilers, may be continued with perfect safety to the operatives.

A Lunkenheimer Safety Non-Return Valve provides the MEANS.

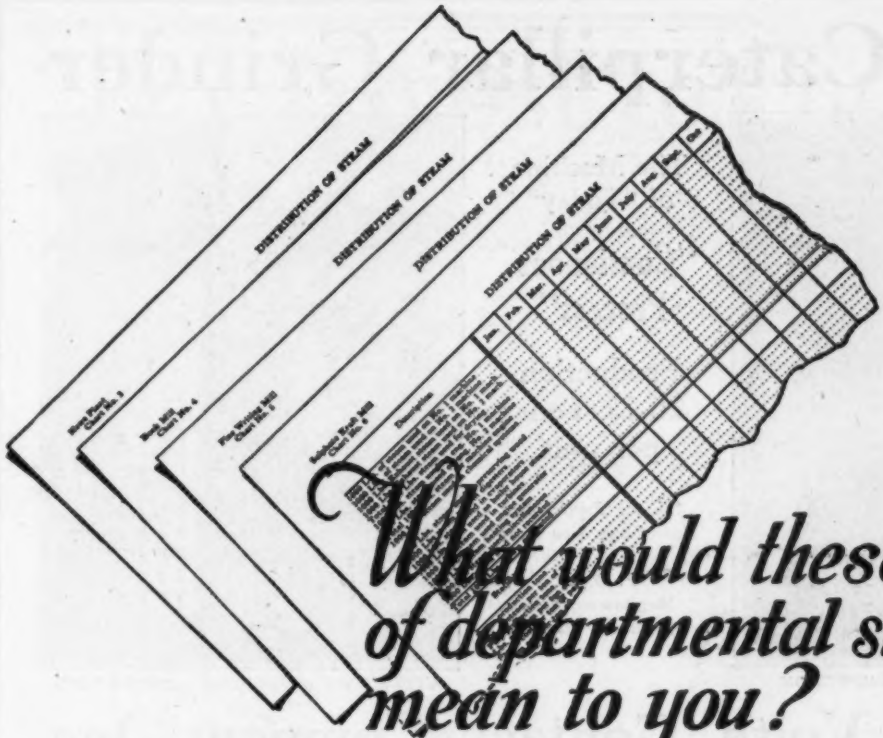
Furnished in Iron Body Bronze Mounted Pattern for pressures up to 250 pounds, 450°F. total temperature and in Steel, Monel Mounted for 350 pounds pressure, 800°F. total temperature.

For detailed information, write for catalog No. 58-FG.

10-20-67

THE LUNKENHEIMER CO.
"QUALITY"
LARGEST MANUFACTURERS OF HIGH GRADE ENGINEERING SPECIALTIES IN THE WORLD
NEW YORK CHICAGO CINCINNATI, U.S.A. BOSTON LONDON
EXPORT DEPT. 129-135 LAFAYETTE ST., NEW YORK

"America's Best since -1862"



What would these records of departmental steam costs mean to you?

IF YOU could have placed before you concise, accurate records of the amounts of steam used by the various processes in your plant this information would be mighty valuable, wouldn't it?

Don't you think that probably you would find from this data that, with your present method of apportioning steam charges, some departments are being unjustly taxed and others are not bearing their share of the burden?

You can have these records; that is power plant cost accounting's gift to the paper industry.

The charts shown above were developed by the Republic Flow Meters Co., in the application of power plant cost accounting to paper mills. They will tell you to the penny how much steam goes into each pound of paper.

How these records are helping accountants determine paper manufacturing costs and pointing out departmental steam wastes is the story of the new standard size booklet "Power Plant Cost Accounting". Another standard size bulletin "The Measurement of Steam", shows how Republic Flow Meters provide the readings that show the departmental steam distribution.

Write for both bulletins.

What *is* power plant cost accounting?

There is nothing involved about power plant cost accounting. It is merely a sensible, systematic setting down of important data on simple forms. These forms, used in connection with the readings of flow meters and other easily acquired data, cover every phase of steam generation and distribution. The extent of the system depends upon the size of the plant. It is profitable in plants of all sizes. This is fully told in Bulletin 14.

Republic Flow Meters Company, 2220 Diversey Parkway, CHICAGO

ONLY ELECTRICALLY OPERATED

REPUBLIC FLOW METERS

Branch Offices

New York, Philadelphia, Boston, Pittsburgh, Birmingham, Detroit, Denver, Kansas City, Dallas, St. Louis, Cincinnati, Dominion Flow Meters Co., Toronto, Can., Herbert Greene & Co., Ltd., London, Eng.

Voith Caterpillar Grinder

MAGAZINE OPEN FOR INSPECTION

The Machine of "Today"

"Continuous Process"

Production 20-22 Tons per unit

Ask for Particulars
Note Large Size Logs

F. O. B.
Manitowoc, Wis.
Brantford, Canada

UPPER PART OF GRINDER SHOWING LOGS

American Voith Contact Company, Inc.

280 MADISON AVE. NEW YORK

Gets 150% More Service from "Sensation" Belt

"In regard to the service of your 'SENSATION' belting compared with the best leather belts we could buy, I am safe in saying we have received 150 per cent more service from your 'SENSATION' Belt than any other belt we have ever used."

ABOVE is just one of many such records our "SENSATION" Belt has made in actual service.

BELOW are a few reasons why the "SENSATION" Belt gives such service.

It is made of the best quality of especially woven duck, closely constructed so that a 4-ply "SENSATION" is 50 per cent stronger than a high-grade leather belt.

Constructed so as not to stretch and require time for taking up. It will hold the belt fasteners secure.

Will not jerk in handling intermittent loads, and cause strain on fastenings, journals and belt itself.

The "SENSATION" Belt is only one item in the "Sensation" Line. Investigate also the "Sensation" Water, Steam and Air Hose. Learn why they never fail in service.

We also manufacture the **Voorhees Rub-Steel Valve**, in four grades, to meet every condition.

Write for samples and literature.

Visit our exhibit in booth 141 Paper Industries Exposition, Grand Central Palace, New York, week of April 9th, 1923.

VOORHEES RUBBER MFG CO
TRADE MARK

Voorhees Rubber Mfg. Co.

Jersey City, N. J.
New York Office: 30 Reade Street
Kansas City: 2045 Main Street

"From Forest to Counter"

IT'S the only brief phrase that fairly expresses the sweep of "Union" operations—logging and cutting-up; pulp, paper and paper bag manufacture; printing, embossing, etc., and sales-distribution, both domestic and export. See the wide and interesting range of products at

Paper Industries Exposition

Grand Central Palace Week of April 9th

Booths 74 and 75

The "Union" Exhibit is most conveniently located. On your way from the elevator to the motion picture room stop and spend a few minutes at our space. Almost everyone will find something of immediate business interest among the many lines of product.

At the crude end of the scale (nearest the Forest) will be found samples of Rough and Dressed *Lumber*. Next, *Pulps*—Ground Wood, Sulphite, Kraft and Screenings. Then *Paper*—for the market, "St. Maurice Newsprint," "Union Kraft" and "Oxroid Mill Wrapper."

And when *Bags* are reached, the range is too wide to permit even listing the various lines. From the coarse Fuel Sacks to the natty Duplex Coffee Packages—some of the latter elaborately printed in three colors and gold—is a far cry. Many suggestive uses appear all along the line. Daily, more and more people are coming to realize that a paper bag is the most economical and "handy" container known to commerce—and that "If a paper bag can do the work, 'Union' can make it."

The value of Union Paper Products depends not so much on their initial cost as on the service they render

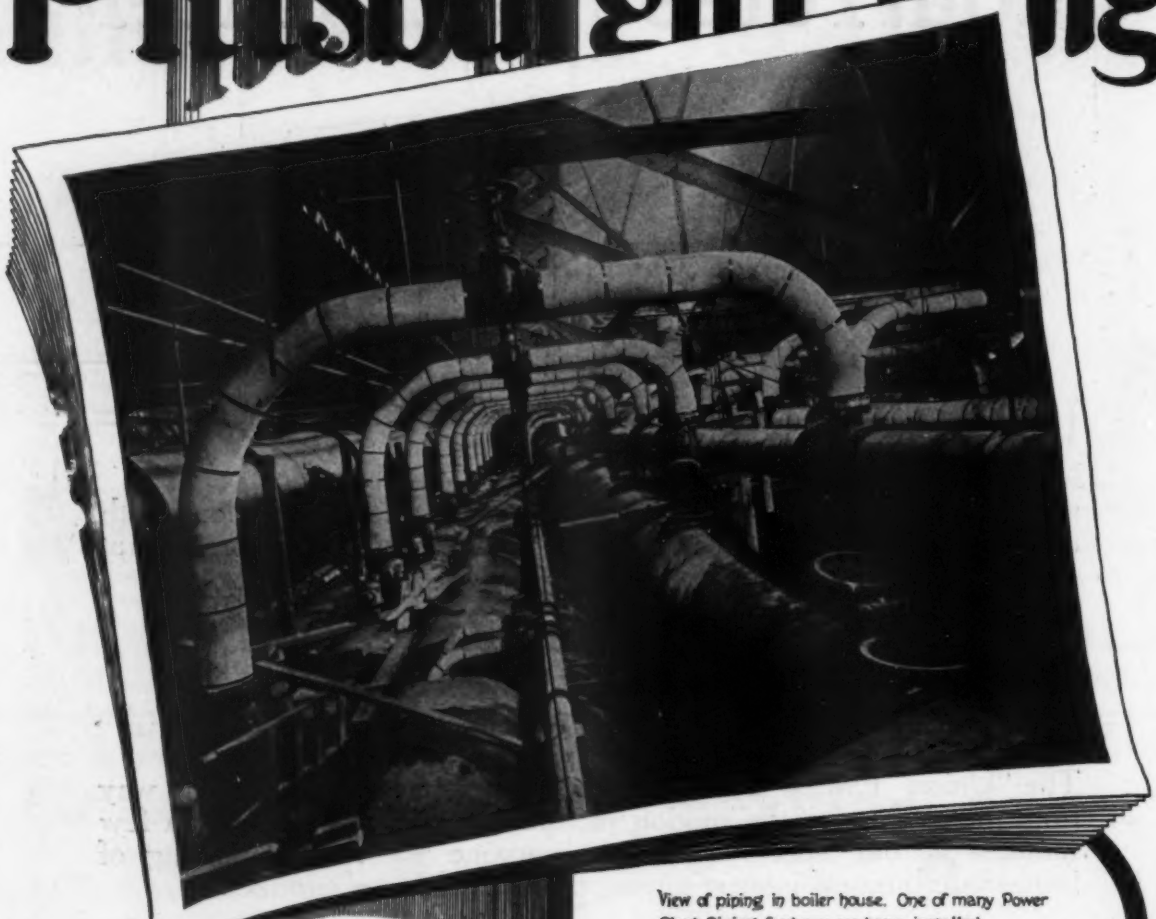
UNION BAG & PAPER CORPORATION

AND ASSOCIATED COMPANIES AND BRANCHES

Selling Agents in American Cities and at Many Points Abroad

GENERAL OFFICES ▪ WOOLWORTH BUILDING ▪ NEW YORK CITY

Pittsburgh Piping



View of piping in boiler house. One of many Power Plant Piping Systems we have installed.

KNOWLEDGE, Experience and Complete Organization—welded together for the manufacture and fabrication of Power Plant Piping that stands for Uniformity, Quality and Distinctive Service.

"WHEN YOU THINK OF PIPING THINK OF PITTSBURGH PIPING."

Pittsburgh Piping & Equipment Co

MANUFACTURERS & CONTRACTORS

Specialists in Welded Wrought Steel Headers, Flanged Iron and Steel Fittings, Pipe Bends and Fabricated Piping for Power Plants.

Pittsburgh, Pa.

NEW YORK, 220 BROADWAY. CHICAGO, PEOPLES GAS BUILDING.
CLEVELAND, AMERICAN TRUST BUILDING. SAN FRANCISCO, MONADNOCK BUILDING.
INDIANAPOLIS, TRACTION TERMINAL BUILDING. BIRMINGHAM, AMERICAN TRUST BUILDING.

A help to auxiliaries as well as main units

Steam consumption of auxiliaries in the average plant is approximately 15 per cent of the total, so where superheating will cut the steam needs of the auxiliaries 20 per cent, as it often does, there is a saving of 3 per cent on the total amount of steam generated. This is an amount that affords substantial dollars-and-cents economy.

A greater percentage saving is made from use of superheat in the auxiliaries than in the main units because the former usually have valves which are more wasteful than the refined valves of the larger units and because most auxiliaries are slow speed with high cylinder condensation. Where auxiliaries are turbine-driven, the protection of blading is just as important as in the larger units.

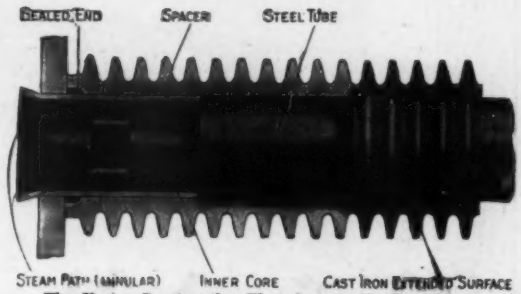
Again, steam lines to auxiliaries are often so placed that they form natural traps for condensation to collect. Superheat eliminates condensation in these lines. This protects engine cylinders from the damage caused by slugs of water in the steam.

In these days of high priced fuel and high operating expense the use of superheat offers a splendid opportunity to hold down rising costs.

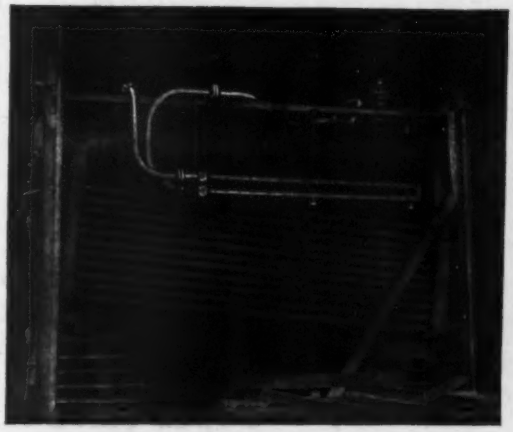
Adaption of Foster Superheaters to, and data from, over 10,000 successful installations enable our engineers to recommend the most desirable apparatus for any given conditions and quote definite performance figures.

Tell us the number, make and horsepower of your boilers and fuel used and type of your driving units and we will give you authoritative advice without obligation.

Have you a copy of the Foster Superheater Book?



The Foster Construction That Assures the Benefits of Superheat with Maximum Efficiency


Foster Superheater installation in water tube boiler

Advantages of Foster Superheater Construction

1. Steel for strength, cast iron for durability.
2. Four to six times as much heat-absorption surface as obtained from bare tubes.
3. Reserve heat stored for sudden demands.
4. Steam stays close to the hot tube surface.
5. Great flexibility of design.

POWER SPECIALTY COMPANY

111 Broadway, New York

Boston Philadelphia Pittsburgh Chicago San Francisco
Kansas City Dallas London, England
Plants at Dansville, N. Y., and Egham, England

FOSTER SUPERHEATERS

Oxford Paper Company

Mills at
RUMFORD
MAINE

Executive Offices
200 Fifth Avenue
NEW YORK

Manufacturers of

High Grade Machine Finish and Super-Calendered Book, Lithograph, Envelope and Tablet Papers

and

"Polar," "Hi-Tone" and "North Star" Coated Book Papers; also Coated One or Two-side Lithograph and Cover

Capacity of Mills: 350 tons of Paper, 150 tons of Soda Pulp, 100 tons of Sulphite Pulp per day

Ten different remedies are specified in this prescription cut on a stick of wood by a Pottawatomie medicine man in Kansas.
Museum of the American Indian.

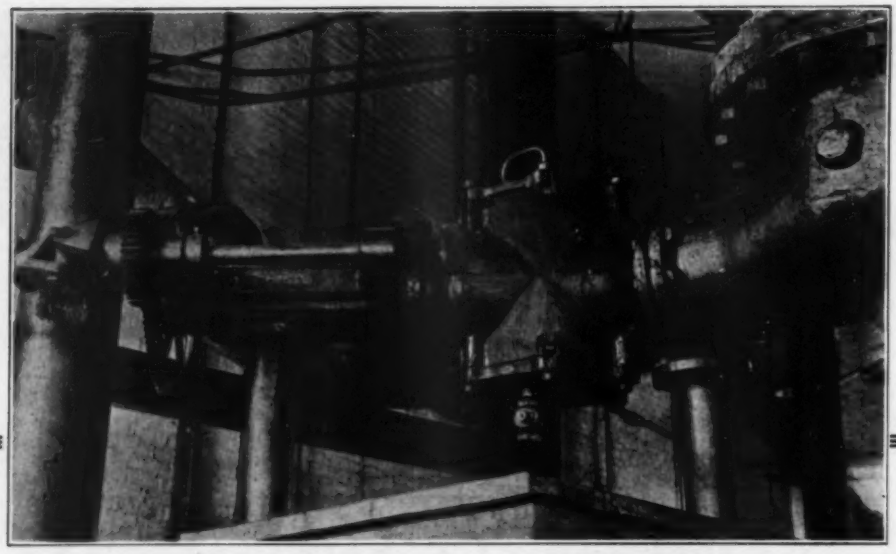
If the doctor wrote your prescription on a stick of wood

Your avoidance of ailments and your recovery from illness are made easier by the contribution of paper to health extension. Witches' herbs and the King's Touch have given way to the medical book and the prescription pad.

Every bottle on your medicine shelf at home speaks to you with a paper label. In the little black japanned box that will be opened when the Doctor has paid his last call, the care of your family is left to a few pieces of paper. Millions of little cellulose fibers stand at attention to serve the physical well-being of you and your loved ones.

Paper is one of the Genii dreamed of by the ancient imaginations of the Orient. It lives with us, serves our every need and whim— and we take it for granted.

Hammermill Paper Company
Erie, Pennsylvania



The HORKMAN

Improved Safety Blow-Off Valve (pat.)

The illustration above shows an actual and a very satisfactory installation of a Horkman Safety Blow-Off Valve. This is in the Wisconsin Rapids Plant of the Consolidated Water Power and Paper Company.

Let us mail you more detailed specifications.

Henry Horkman NEENAH WISCONSIN

MATHIESON System

Bleach Liquors from Liquid Chlorine

MATHIESON service does not end with the shipment of Liquid Chlorine from our works. Our Engineering Department and Sales Organization are always ready to co-operate with you in the solution of your problems.

In our Multiple-Unit Tank Car, we offer a better and safer way of shipping Liquid Chlorine, through the division of the fifteen ton capacity into one ton units. This also facilitates unloading and provides safe and convenient small-unit Chlorine storage. Uncertainty of the amount of Chlorine received is eliminated, as each unit contains exactly 2000 pounds.

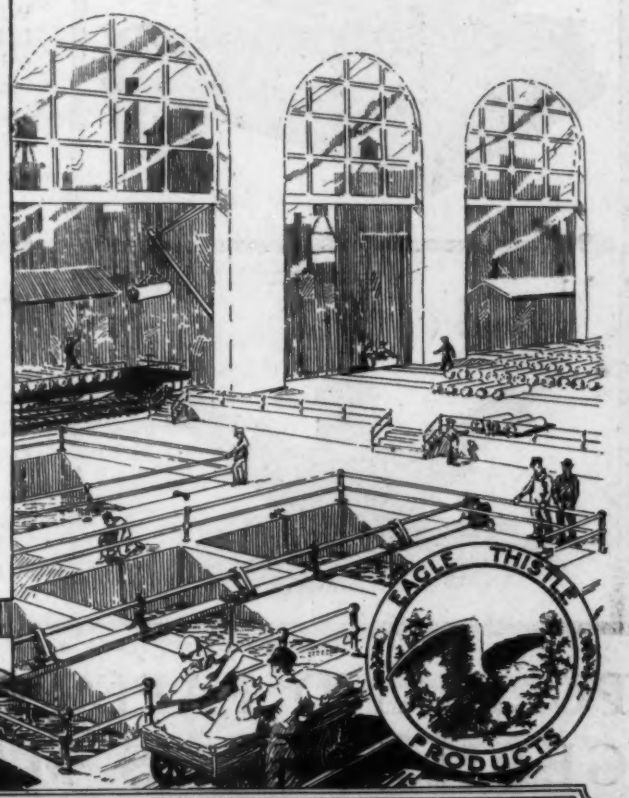
The Mathieson System for preparing bleach liquors from Liquid Chlorine offers another distinctive service. This consists in the absorption of the Chlorine by milk of lime in such a way that the temperature of the liquor is under control at all times, preventing the formation of chlorates with consequent loss of available chlorine. The use of pre-determined quantities of materials makes over-chlorination impossible and insures uniform bleach liquors of any desired concentration.

The installation of the Mathieson System requires no expensive changes in existing equipment and the operation is so simple that unskilled labor can be employed. Our Technical Service Department will be glad to demonstrate the greater economy and efficiency of this system.

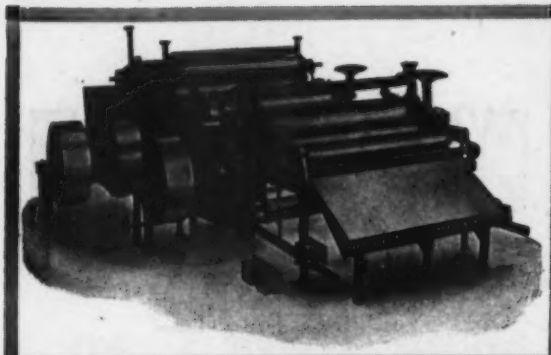
See Our Exhibit—Paper Industries Exposition — Grand Central Palace, New York, Week of April 9th, 1923.

MATHIESON ALKALI WORKS *INC.*
25 WEST 43rd STREET
NEW YORK CITY
PHILADELPHIA
·· CHICAGO ··
PROVIDENCE
CHARLOTTE.

The illustration represents an ideal plant for carrying out this system. The one-ton Chlorine containers are unloaded from our Multiple Unit Tank Car by a crane and transferred on an industrial truck to the storage floor. The containers, as required, are connected to the supply pipes leading to the mixing tanks; the lime is conveyed by means of an industrial truck.



Deal Direct with the Manufacturer



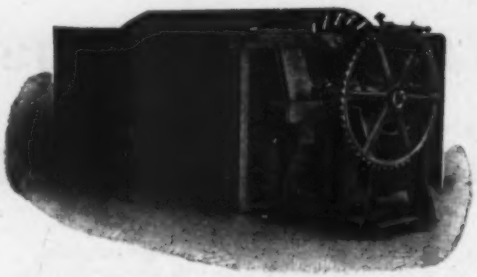
Rogers and Special Wet Machines

SINGLE AND DOUBLE PRESS
FOR CONVERTING CHEMICAL PULP INTO SHEETS 48% DRY

25-30 TONS air-dry pulp per 24 hours. Built in 72" width only, with patented pulp weakening and separating device or our new automatic knife cut-off attachment.

FREIGHT CHARGES are greatly reduced. Savings on this item alone often pays for the machine in one year.

All infringements will be vigorously prosecuted



The Wood's Machine

Used as Pulp Thickeners, Savealls, Pulp Washers and Water Filters

ADVANTAGES:

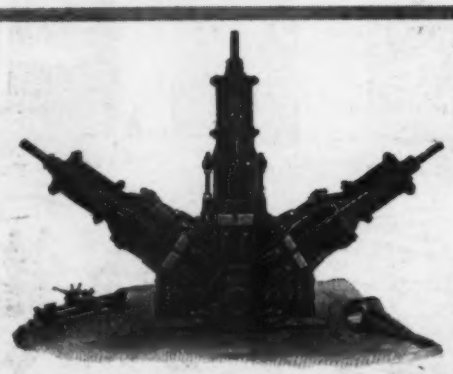
Reduced Wire Costs	No Couch Roll
Enormous Capacity	Minimum Repairs
Only 2 H. P. Required	No Doctor
Works Automatically	Requires No Attention

OVER 100 MACHINES SOLD AND IN USE

Wells Undulating Knot and Sliver Screen

Will bear closest investigation from every angle. It separates knots and slivers from all kinds of pulp efficiently, continuously, automatically with negligible cost for operation and upkeep. Simple but rigid construction. Only best materials used. Operation in plain view.

60 TONS DAILY CAPACITY, STANDARD SIZE. WRITE FOR BLUEPRINT AND FURTHER INFORMATION

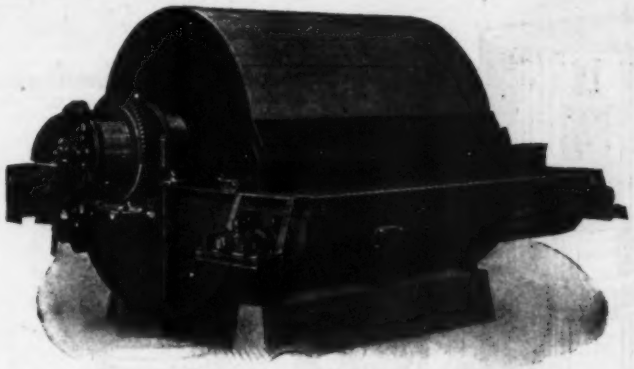


Standard Wood Pulp Grinder

Built in Three Sizes

Taking wood 24", 30" or 32".
Bridge-trees—Are well proportioned.
Flanges—Made of steel, 40" diameter.
Hydraulic Cylinders—Copper lined, 12", 14" or 16" diameter.
Pillow Blocks—22" length of bearing.
Pockets—Very heavy and designed particularly for free discharge of pulp.
Service—Continuous distinctive service is always assured.

PULP AND PAPER MILL MACHINERY
GLENS FALLS MACHINE WORKS
GLENS FALLS, NEW YORK



OLIVER CONTINUOUS FILTER WITH REPULPER

Why the OLIVER Saves Money in the Wash Room

Oliver filters operating in the wash rooms of Soda or Kraft pulp mills, save money in two ways.

First: Increased Efficiency

Olivers wash more efficiently than either diffusers or washing pits. Pulp is washed in a thin sheet instead of in a mass several feet thick. As a result the wash water comes in direct contact with every particle of fibre, displacing the cook liquor thoroughly and evenly. All operations are in view, permitting immediate adjustment for "raw" cooks.

Second: Decreased Operating Costs

Olivers effect the following economies which soon pay the entire cost of their installation.

1. **Wash room labor decreased 60%.**
2. **Soda losses decreased 75%.**
3. **Pulp loss entirely eliminated.**
4. **Floor space reduced 75%.**
5. **Pulp washed with 1/3 less hot water.**
6. **Black liquor sent to evaporators with 1/3 less dilution.**
7. **Amount of pulp in process greatly reduced.**
8. **Time of pulp in process is enormously decreased.**

See Our Exhibit
Paper Industries Exposition
Grand Central Palace
New York
Week of April 9, 1923

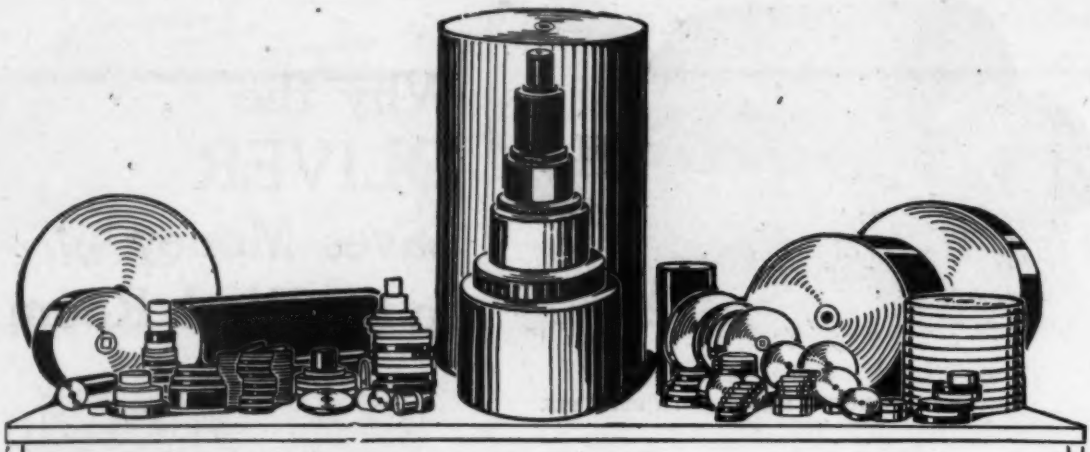
Let the Oliver help you reduce your Wash Room Costs

Oliver *Continuous* Filter Co.

San Francisco
503 Market St.

New York
33 W. 42nd St.

London
11-13 Southampton Row, W. C.



PAPER SALESMEN SAY:

"It is often easier on the voice to sell good rolls of not so good paper than not so good rolls of good paper."

PAPER MAKERS SAY:

"It is always easier on the temper to make good shipping rolls out of a not so good reel on a good Roll-Winder than not so good rolls out of a good reel on a poor Winder."

CAMERON WINDER USERS SAY:

"Cameron Machines turn out good rolls from good paper and as good rolls from paper not so good."

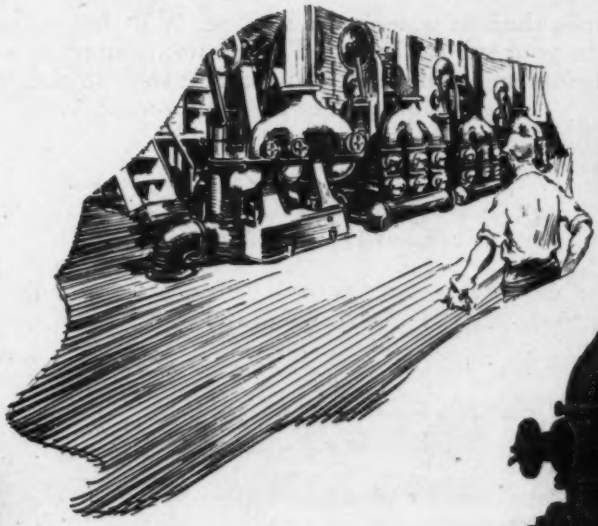
PAPER CONSUMERS SAY:

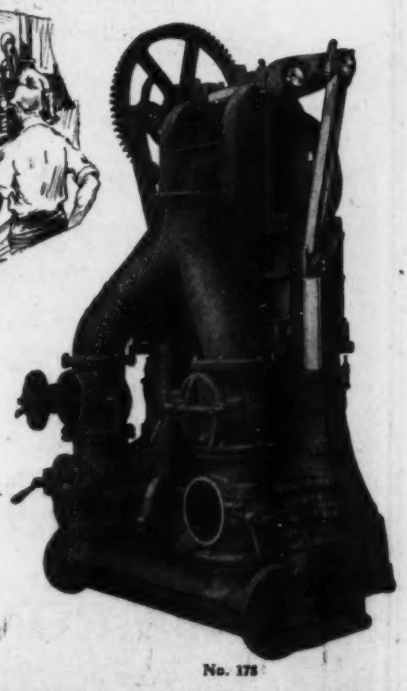
"ROLL, CAMERON, ROLL"

NOTE:

Cameron Machine Co. makes its good roll-winders at Brooklyn, New York. Office address, 61 Poplar Street.

Use Beloit Pumps for Continuous Service





No. 178

No. 77

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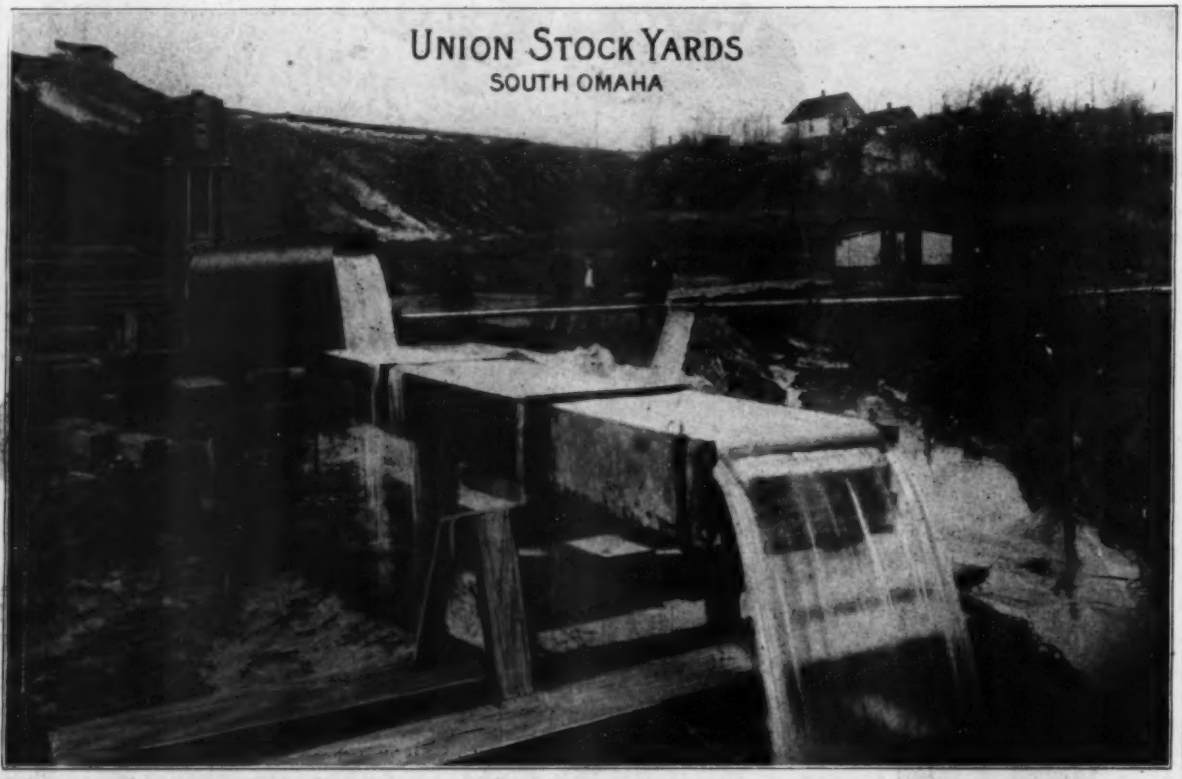

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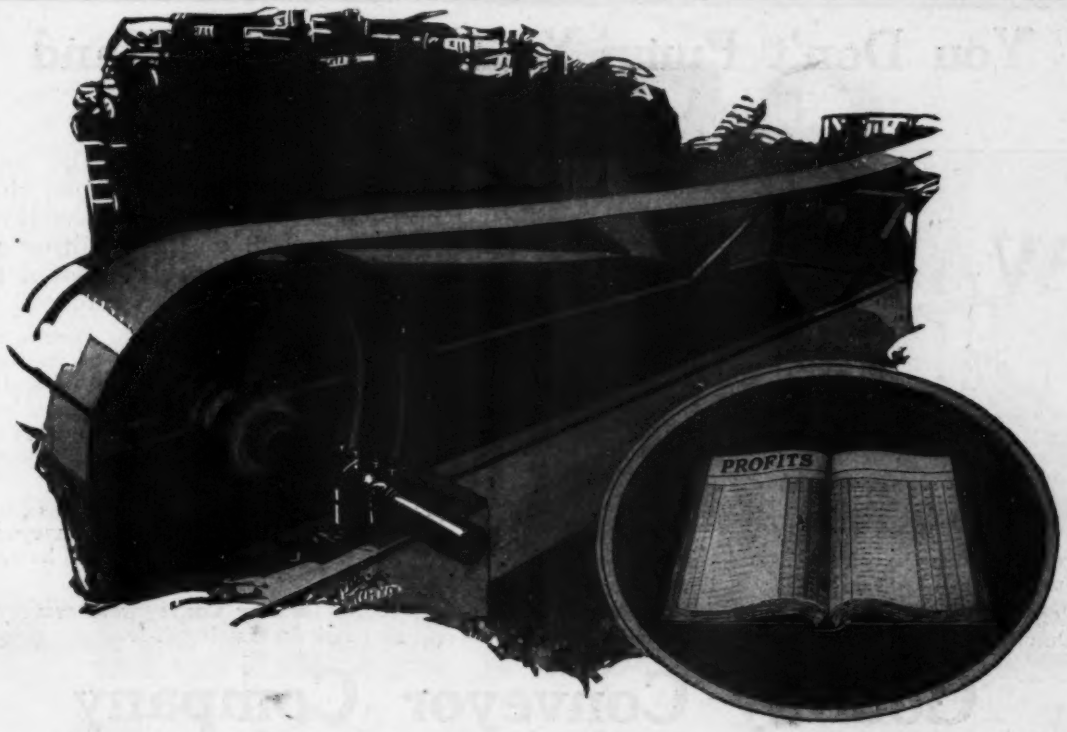

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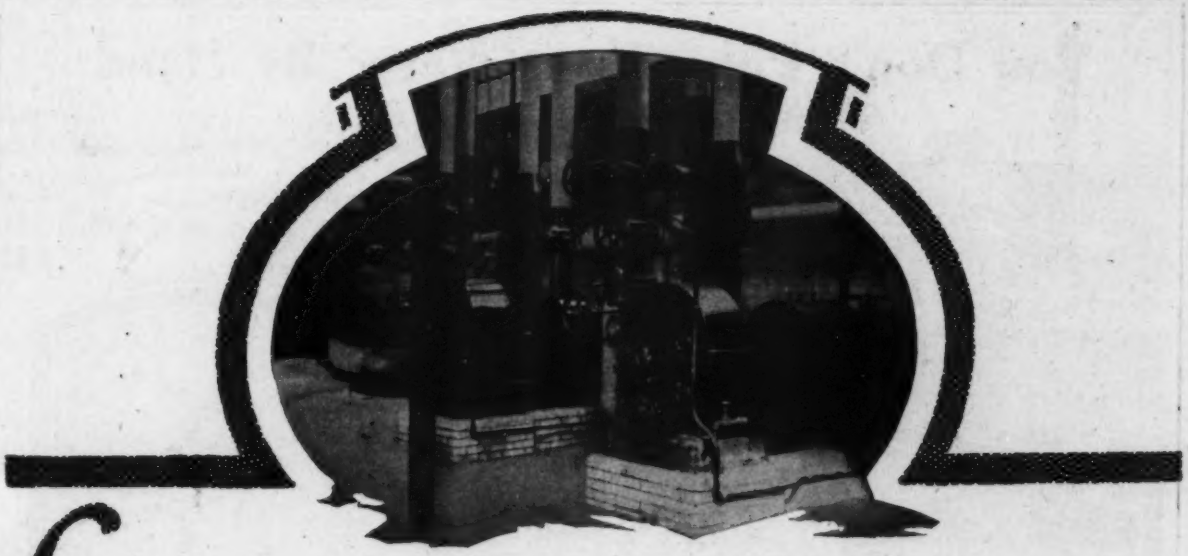

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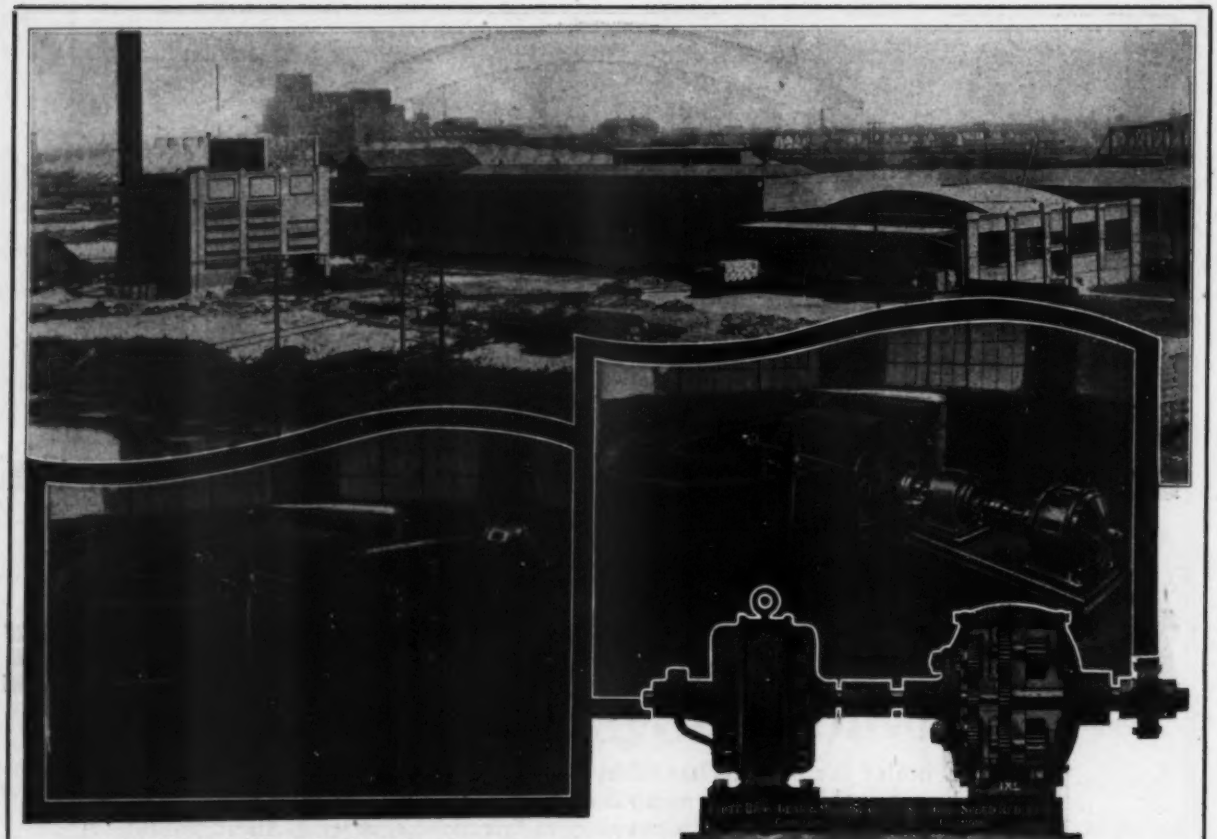

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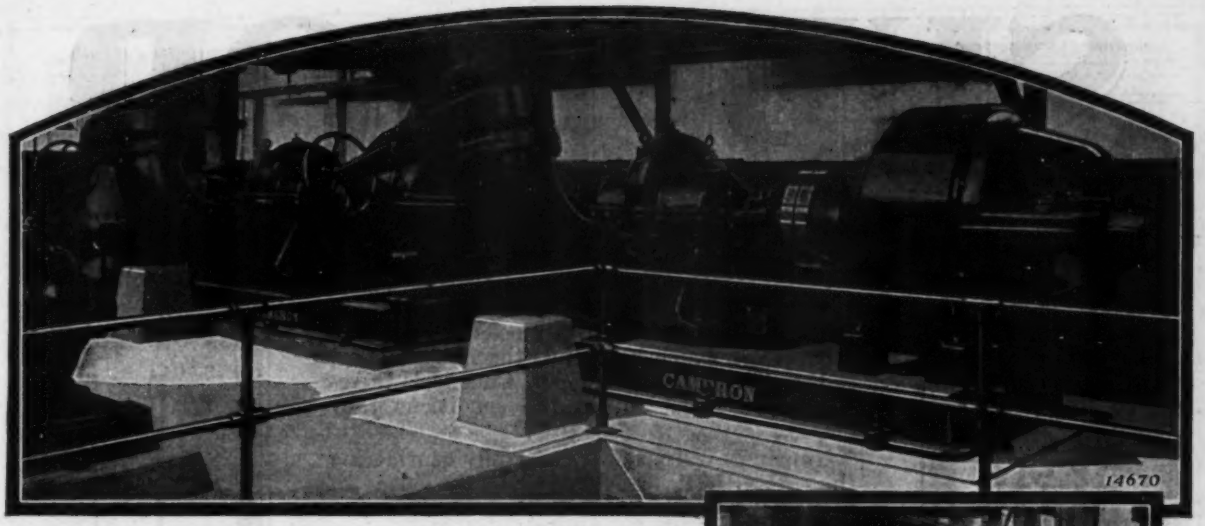

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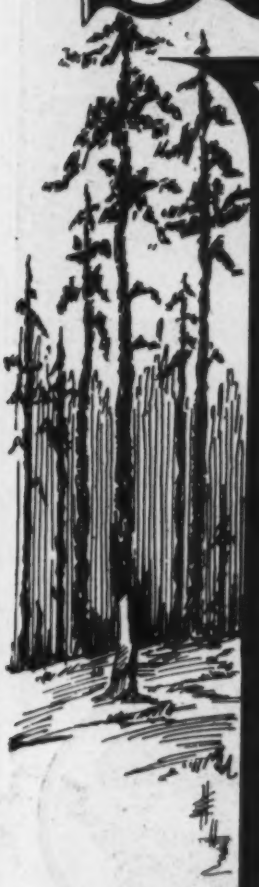

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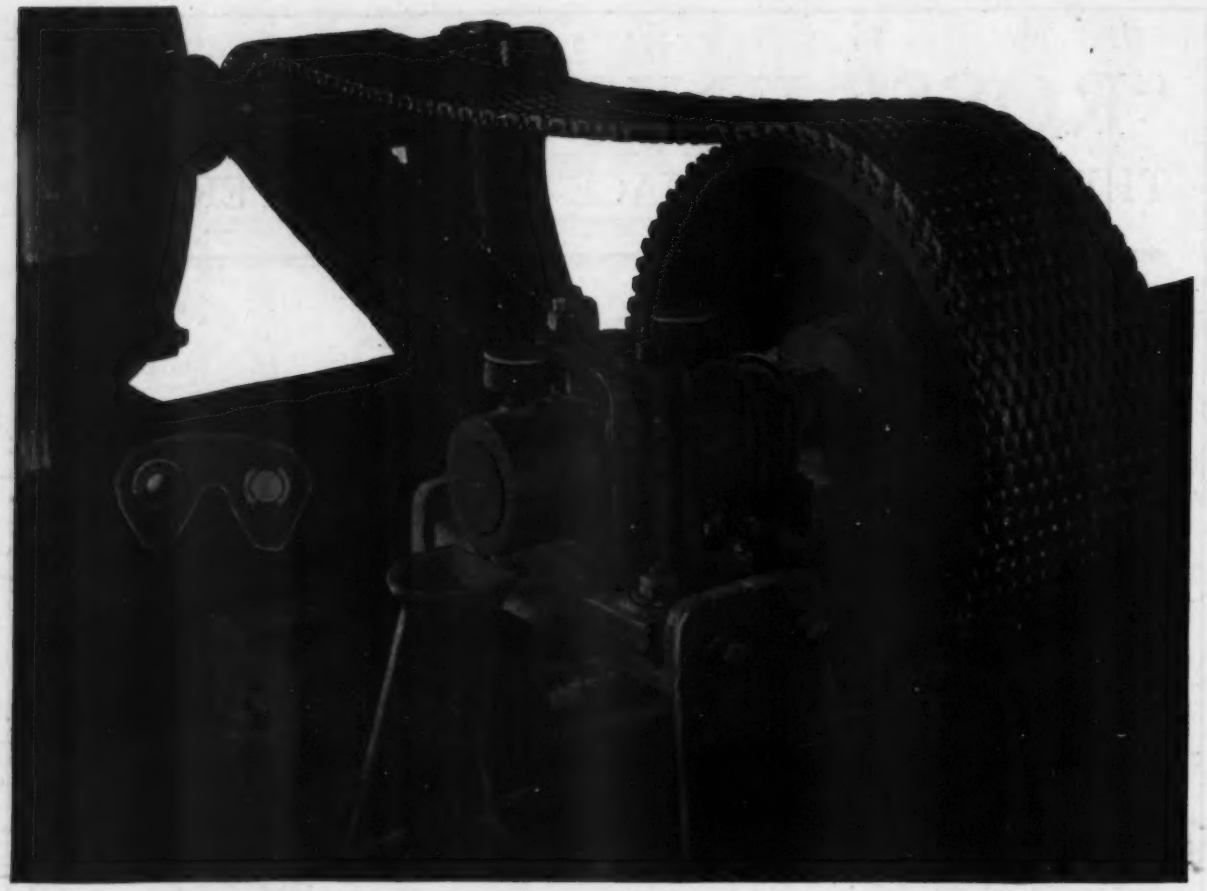

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Results of Experiments in Reforestation

By ELLWOOD WILSON
Chief Forester, Laurentide Co., Ltd., Grand Mere, Quebec

FORESTERS, timber land owners and operators have always been at a disadvantage on this continent in having insufficient data in regard to what goes on in the forests. Beyond a few volume tables and growth studies, very little was known about conditions which affect reproduction, growth and health of trees. Without such fundamental knowledge proper management of woodlands is very difficult.

In addition to lack of knowledge about what went on in the forest, little was known in regard to results which might be obtained by artificial reforestation. There were practically no large scale experiments, and very little was known, particularly in Canada, about nursery practice or the growth of different species when planted out. Very little information had been given out by various Provincial Governments, who had started nurseries, and most of their plantations were too young to give much definite information.

Realizing the above, the Laurentide Company in 1917 approached the Commission of Conservation of the Dominion Government, and suggested the commencement of forest research work. This suggestion met with the approval of the Commission, and work was commenced on May 20th, 1917.

The original arrangement with the Commission of Conservation was that the Laurentide Company would supply the sites for sample plots, both in the forest and on planted lands, and pay part of the expense of the work, and that the Commission would furnish the necessary technical foresters. The budget for the first year was $2,500.00, and approximately this amount has been spent each year, and a great mass of material has begun to accumulate from observations already made. A permanent camp and laboratory was built on Lake Edward in the St. Maurice Valley in the Province of Quebec, for the use of the investigators, and later a permanent kitchen and open air dining room were constructed. After a couple of years the Commission approached other companies along the same lines, and work was done on the lands of the Bathurst Lumber Co. in New Brunswick, Abitibi Pulp & Paper Co. in Northern Ontario, and the Riordon Company. After the Commission of Conservation was abolished, the Dominion Forestry Branch took over this work, and has prosecuted it vigorously, and has established a forest research station of its own at the Petawawa Military Reserve in Ontario. At this latter, permanent sample plots have been laid out in the forest and different cutting methods and rates of thinning have been made, and the results are being carefully studied. The conditions governing seeding, both in the open and under forest conditions, are being studied. The work is being carried on excellently and Petawawa is well worth a visit for anyone interested.

Numerous Experiments Under Way

On the lands of the Bathurst Lumber Company, different methods of cutting are being tried out, on a commercial basis, and also various methods of brush disposal. On the Laurentide Company's plantations at Proulx, near Grand 'Mere, Quebec, sample plots in different species have been laid out, trees have been planted under various densities of birch and poplar. Many experiments in planting first and second quality transplants of different species have been made. Swamps are being drained and planted with various species of trees, and growth on different qualities of soil and forest competitive conditions are being studied.

The Department of Entomology of the Dominion Government has also co-operated in this work, and studies of various forest insects and fungi have been undertaken.

The oldest work was started in a hardwood-softwood forest which had been lumbered for white pine and squared timber between 50 and 60 years ago; then more closely for white pine and spruce sawlogs about 30 years ago. Since then practically the whole area has been cut twice and some of it three times for sawlogs or pulpwood or both.

The object of the investigation was to determine the condition of these cut-over lands with respect to the regeneration and rate of growth of the present pulpwood-producing species, namely spruce and balsam, with a view of estimating the future crop.

The results of the investigation show that the optimistic attitude of lumbermen and limit holders in regard to the reproducing power of this type of forest is not justified. The good yields of pulpwood material at the end of each of the several cuttings in the past 30 years do not represent the amount of growth accrued during the intervals between cutting periods, but are obtained by cutting successively smaller trees, and in general lower grade material, and also by including a larger proportion of balsam in each cut. For example, the spruce stumps were measured and classified according to the age of the cutting on sample plots, totaling 50 acres, and the results are here stated:

In cuttings from 15 to 20 years old the average diameter of the stumps was 15 inches; cuttings 10 to 15 years old, 12 inches; while in cuttings less than 10 years old, the average diameter was 11 inches. This shows a reduction of 4 inches in the average

diameter of the trees taken within the past 15 to 20 years. The actual reduction, however, is doubtless greater, since the measurements record the present diameters of the stumps without making allowance for reduction in size by decay in the past two or three decades.

The tallying of the stumps on the sample plots showed the following increase in the proportion of balsam cut for pulpwood.

On areas lumbered earlier than 15 years ago no balsam was cut. In cuttings from 10 to 15 years old, 65 per cent and 35 per cent respectively were spruce and balsam. In cuttings 5 to 10 years old 45 per cent of the stumps were spruce and 55 per cent balsam, while in cuttings less than five years old the proportion is 22 per cent spruce to 78 per cent balsam.

So far as numbers are concerned, this culled-over forest is well supplied with young growth of potential pulpwood material. The condition of the average acre is represented in the columns below.

	Seedlings Trees up to 1" Diam.	Saplings 1"-4" Diam.	Poles 4"-8" Diam.	Trees Over 8" Diam.
Spruce	635	99	30	6
Balsam	3,972	161	59	6

The casual observer is in danger of being misled if he bases his prediction of an abundant future crop of pulpwood upon the number of young spruce and balsam trees beneath the forest. The amount of future pulpwood material and the time of harvesting the crop, depend as well upon the rate of growth exhibited by the young trees now present.

150 Years to Grow a 12 Inch Tree

Over 2,000 trees were analyzed to determine their rate of growth in diameter, height and volume. While the results of this study have not yet been tabulated, they have gone far enough to justify the statement that within the forest type under consideration, it takes about 40 years for the little spruce trees to acquire a diameter of one inch; 100 years to make a six-inch tree, and 150 years to reach the minimum diameter limit of 12 inches established by the cutting regulations in Quebec, for white and black spruce. Balsam grows somewhat faster. A one-inch tree is made in about 16 years, and it takes in the neighborhood of 70 years to reach the Quebec diameter limit of seven inches at two feet from the ground.

These statements refer to the time required, under the given conditions, to make a merchantable forest from the seedling stage onward. It will be seen from the foregoing table that there are 30 spruce and 59 balsam trees from 4 inches to 8 inches in diameter already present on the average acre. They will furnish another crop of pulpwood material in time, but here again the time is long. The growth tables show that it will require about 70 years for the 4-inch trees and about 50 years for the 8-inch trees to reach the 12-inch diameter limit. The larger balsam, however, will be merchantable in 10 years or less.

There are only six spruce and six balsam trees over eight inches in diameter, on the average acre in this culled forest. This number is too small to justify exploitation alone, so that the next cutting must be delayed until a sufficient number of the smaller trees reach merchantable size. Just how long this will be cannot be determined until our figures are more completely digested, but we have certainly gone far enough to disprove absolutely the frequent assumption that such lands can be cut over every 20 years and the same amount of material secured as before. On these heavily culled lands, it will probably be found that henceforward a period of from 30 to 60 years must elapse between cuttings, if only spruce and balsam are to be removed.

Hardwood Must Be Utilized

It is of course obvious from the foregoing that one of the fundamental problems most urgently demanding solution is some method of utilizing the very large quantities of hardwoods, principally yellow birch. If these could be removed, the rate of growth of the spruce and balsam would be accelerated, since the heavy overhead shade would thus be greatly diminished, making more light available for the pulpwood species. As long, however, as the tendency of every cutting operation is to convert the area more and more into a hardwood forest, as is now the case, the problem is exceedingly difficult. Much further investigation will of course be necessary before final conclusions can be drawn as to what modifications are necessary in the silvicultural treatment of these forests, which have now become so valuable.

Practically all phases of the silvical problems in the management of mixed hardwood coniferous stands are being studied, and the following results have been obtained.

An attempt was made to girdle hardwoods in an effort to remove them from the stand; it was found that they lived usually one to two years after being girdled and seed very heavily before death. Schierbeck tested these seeds and found 99% sterile.

Suppressed conifers respond to the removal of overtopping hardwoods, sometimes even if the trees are 30 or 40 years old and only three feet high.

Seed spots made to mineral soil in order to ensure reproduction showed that the hardwood was more likely to seed in than the softwood.

Some of the Problems Studied

An idea of some of the problems being studied may be gained by describing a few of the objects.

What is the death rate of various size classes?

What seed trees, if any exist now, were responsible for the present stand?

Why should reproduction be so luxuriant in a special plot?

Why is a certain area almost devoid of spruce reproduction?

The raté or height growth of balsam in a dense stand.

What is the reason for a dense stand of Balsam adjoining a pure stand of white and yellow birch, both of the same age?

Is the cause of scanty reproduction due to humus deposit?

Will balsam or spruce come on in leached mineral soil?

How does the average forest reproduce itself?

What becomes of balsam and spruce seedlings now 6" to 1 ft. high, and 25 to 28 years old?

Do the numerous umbrella topped and suppressed balsams and spruces ever grow to be merchantable, and how long will they stand suppression?

What effect will the removal of the crown cover have on such trees?

Does the mountain maple (Acer spicatum) serve any useful purpose in the forest?

Do old brush piles prevent reproduction? (In one case where the litter was cleared off to mineral soil, seedlings grew in one year where there had been no reproduction for 18 years previously.)

An experiment was made in different cutting methods by girdling the big hardwoods, cutting clean, pulling up all advanced growth on one half of the area, the brush was piled and burnt, and on the other half it was scattered. On another plot the coniferous reproduction was left, otherwise the same conditions as above. On another plot everything was cut except the big hardwoods, and advanced reproduction was pulled up. On an adjacent plot conditions were the same as last, but the coniferous reproduction was left.

In a dense stand of large second growth balsam and spruce saplings, the northern half was balsam and the southern half spruce. On this area the following problems are being studied:

Why this division of area.

What seed trees supplied the seed, and how far away they are.

A comparison of the rate of growth of balsam, red and black spruce.

Experiments carried out in planting have demonstrated that Norway Spruce, although it does very well in the nursery, is not suitable for outplanting in this latitude, except on good moist soils; that in any given plantation the rate of growth of individual trees is very uneven and the species, as a whole, is subject to attacks by white pine weevil and borers which attack the terminal shoots. Scotch Pine has also been attacked by white pine weevil.

First Class Stock Should Be Planted

It has been demonstrated that only first class stock should be planted, as the poorer stock makes very little growth and lags behind the rest of the plantations so far as to be almost valueless.

Norway Spruce planted under light cover of hardwoods, white birch, aspen or maple, remains practically stationary, and after four or five years there is some mortality. On drained peat swamps the only trees which show any indication of being suitable are larch, jack pine and white spruce. Norway spruce is not suitable. White spruce will grow in practically any location except very wet swamps, grows rapidly, makes even stands, and is not subject to disease or insect attacks. It also seems to have the ability to push its way up through a hardwood cover, if this is not too dense. Jack pine is also useful for planting under hardwoods and rapidly overtops them.

White Spruce seed collected locally shows nearly double the germinating per cent of that bought from dealers.

Experiments in the control of white pine weevil have been reasonably successful.

It is sincerely to be hoped that the Dominion Government will continue to carry on this most important work, and that as rapidly as possible the results of these investigations will be available to the public.

The Breaking of Wood Grinding Stones

PIECES can break off at the corners of natural stones as well as artificial stones. The reasons for the same may be quite varied. For example in carrying the stone about from place to place too great pressure may be exerted along the edges; careless lifting of the stones by the aid of crane chains, careless unloading of the stones, where the edges of the stones are subjected to sharp shocks or rolling the grinding stone over a stone, lying on a flat pavement or flagging or over a raised stone in an uneven pavement may all have the same effect. Such treatment of the grinding stones gives rise to the formation of fissures, which are the primary cause of the disruption of the stone during the operation of the grinders, as the great pressures that are exerted upon it in the grinding machine are very apt to cause these fissures to widen with resulting splitting off of an edge or corner of the stone.

Fissures can also arise during the process of truing up the stones and sharpening them, due to too great pressure being exerted by the sharpening rolls, as they are passed over the surface of the stones, and also through the interposition of thick wood splinters between the stone and the rolls. As has been explained above these fissures will gradually widen and result in the splitting off of parts of the stone.

Then again when pieces of wood become fast between the grinding stones, preventing the operation of the grinders, and iron crow-bars are inserted to release the stones, there is danger that the pressure will break off parts of the grinding stones. Other possible causes of the breaking of grinding stones are: insufficient watering of the grinding stones be-

fore they are put into operation, too great change in temperature caused by pressing the wood against the stones at too great a speed, delayed addition of the grinding water, too rapid transition to warm grinding, too sudden removal of the grinding water due to the sudden stopping of the steam engine and the water pump connected thereto or the slipping and falling-off of the belt driving the grinder-water pump.

The injury to the stone can vary considerably in its severity. Not only can deep fissures be formed, but the carbonized wood and the carbonized organic constituents of the wood can be made to penetrate far into the internal structure of the stones. When this happens in natural stones, it is possible that large pieces of the stone will be broken off due to the strong overheating of the same. The same effects can be produced in artificial stones as well. Hence the reason for the breaking of the stone must not be sought in the fact that the stone is not of natural origin, but it must be looked for only in the handling and treatment of the stone. The best grade of stone can be spoiled by improper handling, and when care is taken even a poor stone will last for a long time.

It is interesting to note the behavior of the natural and artificial stones when subjected to high temperature. The opportunity of doing so was afforded by fires in certain German and Austrian paper mills. The high temperature causes the splitting off of corners of the stones. In one case the artificial stone broke off only to the iron framework holding it, while the natural stone broke clean to the center.

Proper Care Is Essential

Most of the causes of the breaking of grinding stones can be circumvented by the exercise of proper care in the handling, for example, the interposition of wooden boards so that the stones do not strike up against stone or iron. In sharpening the stones care should be taken to see that the sharpening rolls are not pressed too tightly against the surface of the same. The sharpening of the stones should be carried out as far as possible from the frontal surface towards the middle of the casing surface. The pressure boxes should be moved up regularly and steadily so as to prevent any dangerous splinters passing through. Crow-bars, made of iron, should not be used to pry loose the stones when they become fast due to large splinters of wood; wooden levers should be used instead.

Furthermore it is very important that the stone be thoroughly washed with water before it is put into operation, so that its entire mass is saturated. It is also very important that the water, which is allowed to play upon the stones during the operation of the grinders, be regulated properly so that a sufficient stream is always flowing, at the outset and is then gradually reduced so that the stones are warmed up slowly. The pressure exerted against the stones, being transmitted through the logs, should be increased gradually. Similarly when the grinders are ready to be stopped, the same precautions must be followed out so that the stones are not allowed to cool off too rapidly. The cooling water must not be turned on too rapidly for the same reason. Consequently, after the pressure on the grinding stones has been relieved, the water must be turned off at once and the stones must be allowed to run free for quite a time.

Another way in which the stones may be effectively protected against breaking is to round off the edges and corners as much as possible. A radius of 5 to 10 centimeters is not at all too great. The stones should be made wide enough. It is a natural phenomenon, which can be readily proven, that the contraction and expansion of the stones take place in an ellipsoidal direction. This property of the stones, more than any other, explains why it is necessary to round off the edges of the same as much as possible. Stones, with rounded edges, are much more conveniently transported from place to place and are also much easier to sharpen, inasmuch as in this case too great pressure cannot be exerted against the edges.

The sharpening of the stones should be carried out often and not too strongly, only one passage being made over the surface of the stones. When the sharpening rolls are pressed too tightly against the stones only a coarse sharpening effect is attained and the stone is worn down too quickly, which is wasteful. Meteor sharpening rolls, which are provided with needle-steel pegs, are recommended as best for this purpose, as they have just a slight action on the stones and sharpen them very nicely.

In this connection it must also be mentioned that a grinding stone, which has been thoroughly saturated with water, is not as solid as a dry stone, and that such a stone becomes hard again after drying out. For example an air-dried natural stone had a tensile strength of 16 kilograms per square centimeter, while the same stone, saturated with water, had a strength of only 11.4 kilograms per square centimeter. Another air-dried natural stone possessed a tensile strength of 11 kilograms per square centimeter, while, when saturated with water, it possessed a tensile strength of only 5.4 kilograms. It is accordingly no wonder that it is possible to scratch the water-saturated stone with the finger nail.

Tests, which were conducted by an unbiased investigator at the government testing laboratories, revealed the fact that artificial stones possessed a considerably greater hardness than natural stones. It is also self-evident that artificial stones likewise possess less tensile strength in the water-saturated condition than in the dry state, and that they regain their former hardness as soon as they dry out again.

The Relative Strength of Sheet-Machine and Hand Mould Sheets

By E. SUTERMEISTER

WHEN the methol of testing sulphite pulp for strength by beating in a pebble mill was first described by the writer[1] in 1915 it was proposed to make the beaten pulp into sheets on a hand mould. It was thought that this method of making the sheets was sufficiently accurate for the purpose for which the test was developed, though it was realized at the time that it was not all that might be desired. The principle source of error when making the sheets in this way are first, those involving the personal factor which include the depth of dipping the hand mould into the stock and the rapidity with which it is passed through it, and second, the effect of slowness or greasiness of the stock on the thickness of the sheet produced. This second factor is probably the more important of the two and certainly introduces more serious errors for they vary with the susceptibility of the stock to hydration, while the personal error is usually a fairly constant one.

It is quite obvious that both sources of error could be very largely eliminated by substituting for the hand mould some form of apparatus in which a definite volume of stock, at a constant concentration, could be poured onto a wire screen which would retain all the fiber and serve as a base on which the sheet would be formed. Doubtless many forms of such apparatus have been designed and used by various persons, but few of them have been described in print and those with which the writer was familiar were not entirely satisfactory. In 1920, however, Mr. K. G. Wilen published a paper on "Testing Kraft Pulp for Strength"[2] in which he gave the details of a machine which had been used with entire success in the laboratory of the Wayagamack Pulp & Paper Co. This appeared so promising that a similar machine was constructed with Mr. Wilen's permission and form plans modified slightly from those which he was kind enough to supply. This machine has now been in daily use for nearly a year and a half and has given such complete satisfaction that a return to the use of the hand mould would not be considered.

Before changing from the hand mould to the sheet machine careful tests were made to show what strength the same fiber would show when made into sheets by the two methods, and it is believed that the results of these tests would be of interest to other workers in this field.

(1) A Beating Test for Paper Making Fibers—Paper, Nov. 10, 1915
(2) Pulp and Paper Magazine, Nov. 18, 1920.

The first tests were made with bleached sulphite taken from a wet machine and containing about 23% bone dry fiber. The moisture was determined and four samples equal to 50 grams air dry fiber were weighed out. Two of these were beaten in a pebble mill under exactly the same conditions and then made into sheets, one on the sheet machine, and the other on the hand mould. The volume of water and stock to use in making the machine sheets was so adjusted that the weight of the sheets should be the same as the average of the four hand mould sheets. The other two samples were made into sheets in the same way but without being beaten in the pebble mill. Tests on these samples are reported under the headings "wet beaten" and "wet unbeaten."

From the same lot of wet machine sulphite other samples were taken, spread out and allowed to become thoroughly air dry. These were then tested in the same way as the wet fiber and the results given under the headings "dry beaten" and "dry unbeaten."

Similar experiments were carried out with bleached soda poplar fiber and a few with unbleached sulphite and unbleached kraft sulphate. Both the latter were air dried before weighing out the samples for beating in the pebble mill. In all the beating tests the same pebble mill was used so that no possible variation could be introduced for this source. All bursting tests were made with Ashcroft testers, a 0-140 lb. instrument for strong sheets and a 0-20 lb. tester for sheets testing less than 20 lbs.

The following table shows the average bursting strength in pounds per square inch for five tests on each of four sheets, 20 tests in all. The figures for difference give the increase or decrease of the machine made sheets over those made on the hand mould.

		Bleached Sulphite			
Sample No.	Sheets made by	Wet beaten	Wet unbeaten	Dry beaten	Dry unbeaten
1.	Machine	68.4	36.8	61.4	16.1
	Hand mould	53.9	38.6	47.6	14.5
	Dif.	+14.5	- 1.8	+13.8	+ 1.6
2.	Machine	68.1	37.7	56.9	18.2
	Hand mould	50.6	38.0	47.0	17.6
	Dif.	+17.5	- 0.3	+ 9.9	+ 0.6
3.	Machine	65.0	34.4	55.8	12.7
	Hand mould	60.1	34.0	50.2	16.0
	Dif.	+ 4.9	+ 0.4	+ 5.6	- 3.3
4.	Machine	60.6	37.4	59.4	19.1
	Hand mould	50.2	38.1	43.4	18.5
	Dif.	+10.4	- 0.7	+16.0	+ 0.6

5. Machine	70.7		62.0	
Hand mould	73.0		54.6	
Dif.	− 2.3		+ 7.4	
Bleached Soda Poplar				
1. Machine	42.3	29.2	37.6	14.1
Hand mould	28.9	23.0	24.5	8.5
Dif.	+13.4	+ 6.2	+13.1	+ 5.6
2. Machine	45.4	34.6	39.3	10.1
Hand mould	30.8	26.7	25.9	13.9
Dif.	+14.6	+ 7.9	+13.4	− 3.8
3. Machine	44.4	34.1	40.5	13.8
Hand mould	27.9	24.2	25.5	14.5
Dif.	+16.5	+ 9.9	+15.0	− 0.7
4. Machine	52.7	40.2	39.0	
Hand mould	38.8	28.4	28.9	
Dif.	+13.9	+11.8	+10.1	
5. Machine	53.1	35.7		
Hand mould	34.0	30.7		
Dif.	+19.1	+ 5.0		

Unbleached Fibers

Sample—	Sheets made by	Dry beaten
Sulphite No. 1	Machine	50.5
	Hand mould	45.6
	Dif.	+4.9
Sulphite No. 2	Machine	58.6
	Hand mould	50.0
	Dif	+8.6
Canadian Kraft	Machine	54.8
	Hand mould	60.7
	Dif.	+4.9
Foreign Kraft	Machine	54.4
	Hand mould	60.5
	Dif.	−6.1

From an analysis of these results it appears that with sulphite the sheets from unbeaten fiber average a little weaker when made by machine than when made by hand mould. This is to be explaned by the freeness of the stock, for since the unbeaten sulphite is very free, passage of the hand mould through the stock permits more fiber to collect than would correspond to the volume taken for the machine made sheets, and the heavier sheet results in a higher test. On the other hand the beaten fiber, with one exception, gives stronger sheets when made by machine than when made by hand. This is the reverse of the preceding case, for here the slowness or greasiness of the beaten stock prevents the rapid deposit of the fiber on the hand mould and much of it slides over the sides as the mould passes through. This difference depends on the rapidity with which the stock hydrates during beating and as this varies with the different fibers it is evident that there could be no constant factor to convert the strength for one type of sheet into that for the other type.

With soda poplar fiber all sheets, except those for dry unbeaten fiber, are stronger when made on the machine than when made on the hand mould. With the dry unbeaten fiber two samples out of three gave stronger sheets on the machine but the number of tests is too small to be certain of this point.

It is interesting to note that of the unbleached fibers the two sulphites gave greater strength with the machine made sheets while the kraft sheets were stronger when made on the hand mould. It is believed that the cause of this is again difference in the rate of hydration of the two fibers.

During the course of this work it became necessary to see whether the sheet machine would make sheets of constant weight regardless of the hydration of the stock. To prove this point three samples of sulphite were taken and four samples of 50 grams prepared from each. With each kind of sulphite one sample was beaten one-half hour, the second one hour, the third an hour and a half and the fourth two hours. After beating these were made into sheets in the usual way and the weight of four sheets found. The results follow:

Weight of four sheets in grams.

	Sul. No. 1	Sul. No. 2	Sul. No. 3
Beaten ½ hour	19.5	19.6	20.0
Beaten 1 hour	19.4	19.7	19.6
Beaten 1½ hours	18.9	19.3	19.1
Beaten 2 hours	19.2	19.1	19.2

The difference in beating in these samples was very marked; the sheets made from the fibers which had been beaten half an hour were soft and fuzzy, while on the other end of the series those from stock beaten two hours were very hard and almost parchmentized.

The conclusions reached from this work are that the sheet machine will give sheets of practically constant weight regradless of the time of beating, within reasonable limits; and that there is no possibility of calculating from the tests on hand mould sheets what those on machine made sheets would be. It is believed that much more reliable results can be obtained if a sheet machine is used and it is recommended that, wherever possible, the use of the hand mould for quantitative work be abandoned.

A superintendent of a large Kalamazoo mill digs this one out of his early experiences.

He came over from England to this country when only a young fellow and went right to work in the mill. Working on the same crew with him were a number of Hollanders who had been in this country two or three years and were finding the new language very difficult to master.

Knowing that our English friend had come from the "old country," one of the Hollanders asked him one day how long he had been over.

"About six months," answered the Englishman.

In a voice mingled with more amazement and admiration than good English, the Hollander exclaimed, "Gee, you learn United States talk quick!"

The Fourdrinier Machine

By HARRY E. WESTON
Instructor in Pulp and Paper Manufacture, The New York State College of Forestry, Syracuse, N. Y.

This is the fourth installment of the article on the Fourdrinier machine in preparation by the author. Further installments will appear in succeeding issues.
—Editor.

A NUMBER of regulators have been put on the market for automatically controlling the temperature of paper machine dryers. Probably four of the most important systems of this kind are:

1. Pickles Patent Automatic Steam Regulator.
2. Stickles Automatic Steam Control.
3. Witham System.
4. The Tag Temperature Control System.

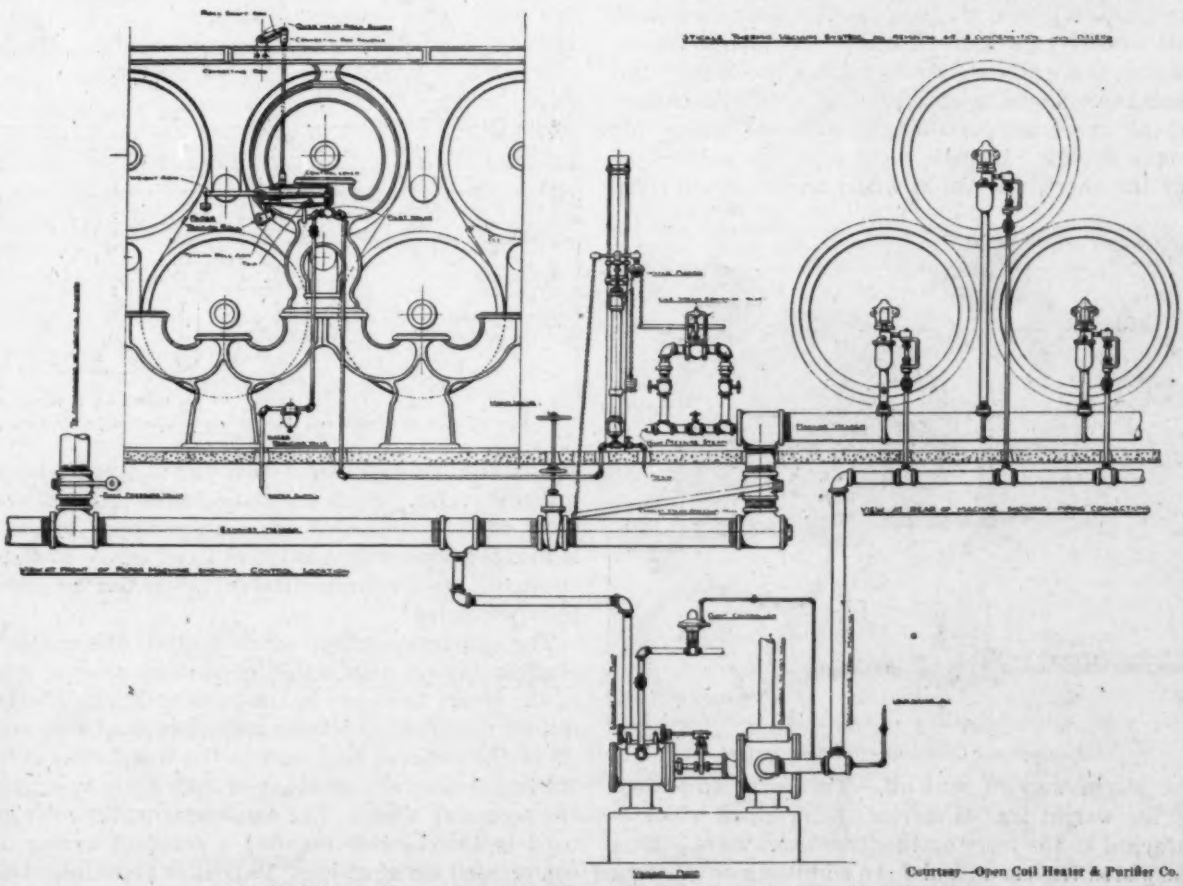
The operation of the Pickles Drying Regulator is dependent upon the varying system of the draw between the dryers near the dry end of the machine. This tension varies directly with the dryness of the paper.

The action of the regulator is purely mechanical. It is governed by the expansion and contraction of the paper as it passes over a swinging roll. A special balanced valve, actuated by means of flexible wire cable, is used to regulate the admission of steam into the drying cylinders.

The variation of the tension is taken by means of a swinging roll. If the paper becomes moist, the draw becomes slack. This slackness permits weights on the end of the swinging roll arm to pull the arm down and thus open the valve on the main steam admission to the dryers. As the paper becomes dry, the draw gets tighter thus forcing the roll toward the top dryer. The raising of the roll causes the end of the arm to be raised. This closes the valve the required amount to prevent the paper from snapping off between the dryers due to its being too dry.

The tension of the draw is balanced by weights on the end of the arm. The percentage of moisture required in the sheet is regulated by means of these weights.

The action of the Stickles Automatic Steam Control for paper machines is also mechanical.

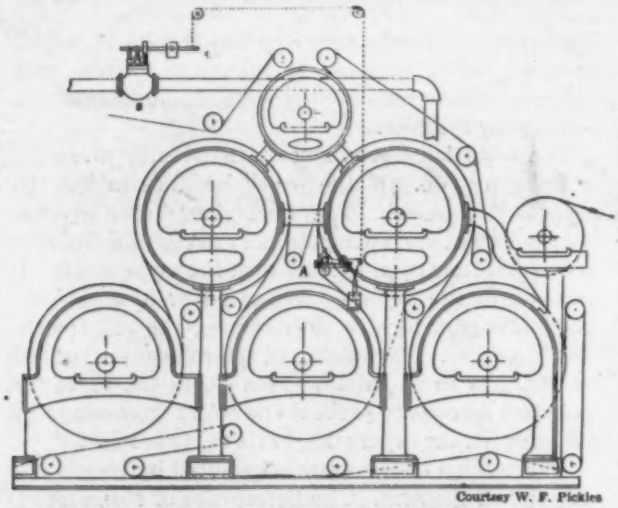


Courtesy—Open Coil Heater & Purifier Co.

Stickle Thermic Vacuum System for Removing Air and Condensation from Dryers

The following cut shows very clearly the layout of such a system:

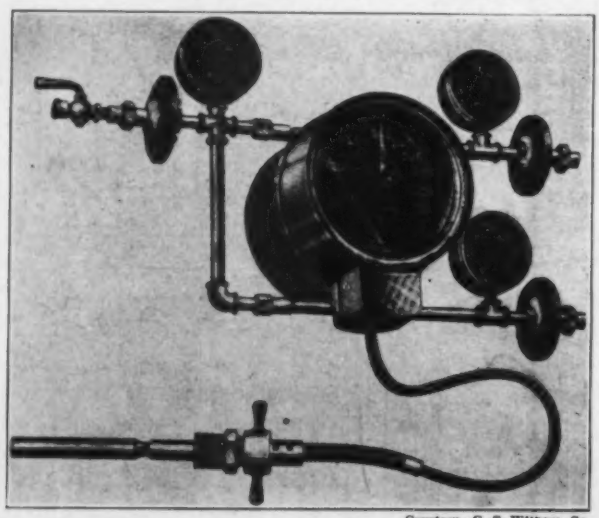
When the sheet draws up on the tension roll, the pilot valve opens and admits auxiliary pressure to



Courtesy W. F. Pickles

Pickles Automatic Steam Regulator for Paper Machines. A—Regulator. B—Regulator Valve on Main Steam Admission Line

the bottom of the piston. The upward movement of the piston closes the live steam valve by means of a chain and weights. Only a slight variation in the draw of the sheet will actuate the pilot valve and this auxiliary pressure operates the steam valves. In case the machine should require live steam, the pilot valve would open and close with the change of the sheet and only admit sufficient steam for proper drying. If there were sufficient exhaust to dry the sheet, the piston would travel up until the



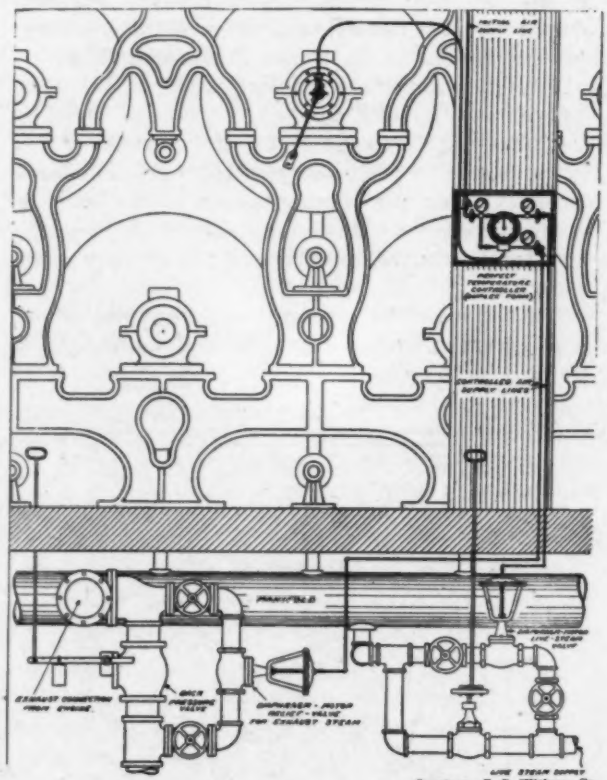
Courtesy—G. S. Witham, Sr.

Temperature Controller—Witham System

live steam was all shut off. This is accomplished by the weight that is carried on the chain which is attached to the lever on the live steam valve. Thus the piston travels up and down admitting or shutting off steam as is necessary.

The closing of the pilot valve allows the auxiliary pressure to leak away and the piston moves downward. The pressure is again built up as the pilot valve opens, causing the piston to travel upward with the tendency of closing the live steam valve.

The Witham System is based upon the theory that the temperature of the dryers is kept uniform by varying the steam pressure within the manifold. The accompanying illustration shows a typical installation of the Witham System. The manifold, diaphragm-motor valves, and temperature controller are clearly shown. The diaphragm-motor valves are placed in the steam lines by means of a by-pass



Courtesy—G. S. Witham, Sr.

Witham System of Automatic Temperature Control for Dryers

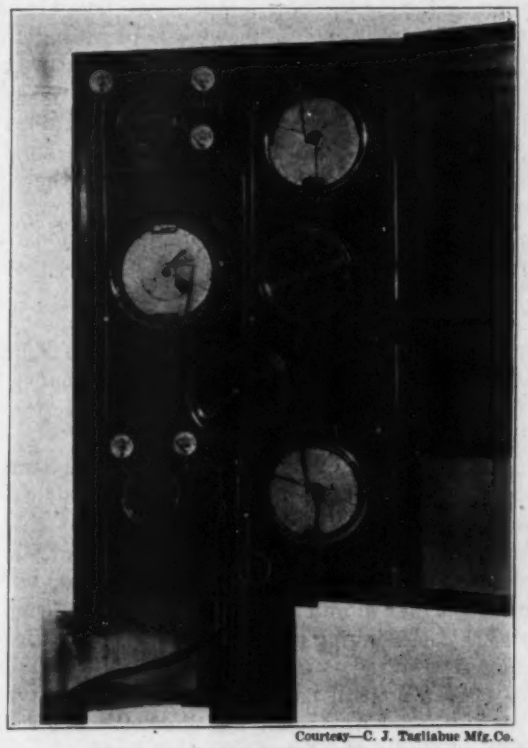
around the live steam hand-valve and around the back pressure valve. Such an arrangement still allows hand control in case of emergency. Each by-pass is also provided with additional hand valves so that either of the diaphragm-motor valves can be completely isolated.

The diaphragm-motor which controls the exhaust steam acts as a relief valve by allowing more or less of the steam to escape to the exhaust head. If conditions require it, the valve may close dead shut and all of the exhaust may pass to the manifold. Then the live steam valve would open sufficiently to supply the necessary steam. The diaphragm-motor valve as used in this system requires a constant source of compressed air of at least 15 pounds pressure. The air must be free from oil, moisture and other im-

purities. The compressed air does the actual work of manipulating the steam valves. The valve starts to close as soon as compressed air is admitted to the diaphragm top. Increasing the amount of air closes the valve still further. The valve can be closed until it is dead shut by the admission of compressed air. As soon as the pressure is relieved, the valve will begin to open and the less the air pressure, the wider is the valve opened. The amount of steam that is allowed to enter the manifold due to the air pressure operating the diaphragm-motor valve is dependent upon a temperature controller. The temperature controller varies the air pressure in accordance with the tendency of the temperature to fall or rise. The controller is provided with a dial and pointer which is used to set and maintain any temperature desired. As soon as the amount of steam required is insufficient to maintain the temperature for which the controller is set, the valve controlling the live steam supply is opened and only enough live steam to make up the deficiency is admitted to the manifold. This accurate arrangement is dependent upon the thermostatic bulb of the controller. It is provided with an extension stem of sufficient length to bring the bulb well into the drying cylinder and is so arranged that it can be properly connected to the cylinder through the journal. A capillary tube of fine bore copper wire of sufficient length and protected from injury by a flexible copper armor, joins this thermostatic bulb to the rest of the controller. The controller box is arranged with a capsular spring connected to the thermostatic bulb, adjustment screw for establishing the temperature at which the controller is to function, pointer and dial for enabling close adjustments, and air valves. This arrangement is then complete to operate the diaphragm-motor valves which in turn admit or shut off steam from the manifold as required.

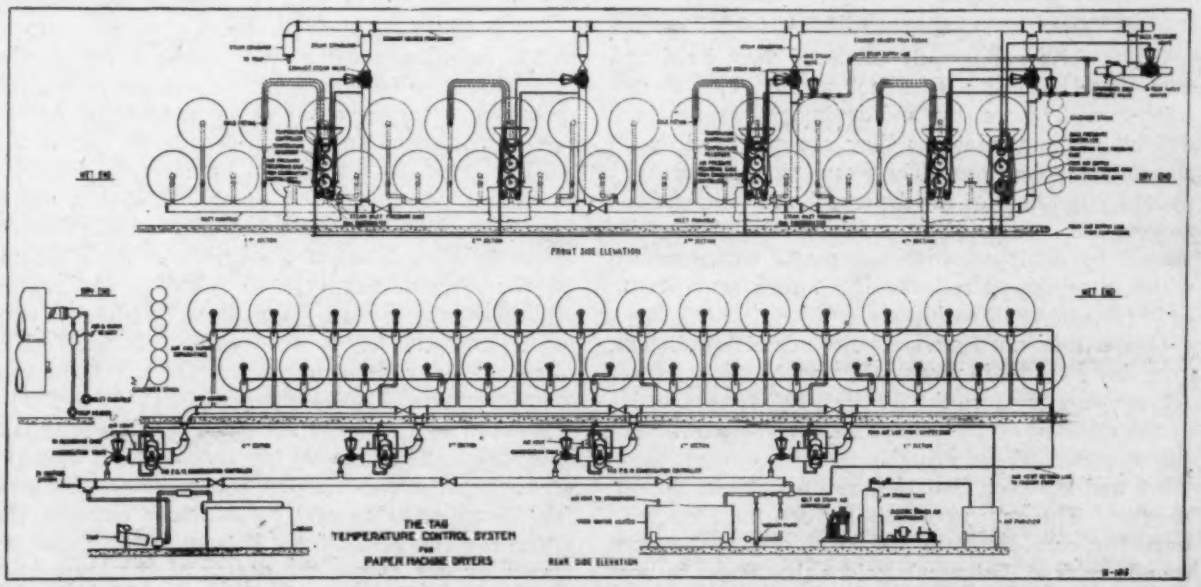
The Tag system divides the drying section into a number of batteries, usually four, and the temperature of each battery is individually regulated by an automatic temperature controller. The controller is so designed that the setting point can be quickly and easily changed as conditions demand.

This individual sectional control permits the main-



Courtesy—C. J. Tagliabue Mfg.Co.

Instrument Panel of Tag System
Legend:
Tag Duplex Temperature Controller—Top Left
Recording Thermometer—Top Right
Recording Pressure Gauge for Condensate Controller—Center Left
Dial Indicating Thermometer—Center Right
Steam Pressure Gauge—Lower Center



tenance of gradually increasing temperatures in the dryers from the wet end to the dry end. The temperature in one section may be changed irrespective of the temperature of any of the other sections. A turn of the indicating hand on the controller face results in an instantaneous change of temperature setting. A large dial thermometer, provided for each section, indicates the new temperature that the controller is maintaining. Likewise a recording thermometer gives present and previous temperature conditions and provides a means of permanent records.

Each controller operates two diaphragm-motor valves. One of the valves is on the exhaust steam manifold and the other on the live steam manifold of each respective section. Exhaust steam is used for all ordinary demands, but when it is necessary, exhaust steam is supplemented with live steam.

A device has recently been installed on one of the machines in the middle west which, when a break occurs, automatically shuts off both the exhaust and live steam entering the first and second sections of the wet end.

Other controllers are also used in this system to obtain prompt and effective drainage of condensation from the dryers and to eliminate entrapped air. All controllers require compressed air at fifteen pounds pressure for the functioning of the diaphragm valves. An air purifier eliminates moisture and oil from the air so that continuing operation of the automatic controllers is assured.

A typical control panel as is used in this system is shown in the accompanying illustration as well as a typical application of the system to the dryers of a paper machine. It has recently been learned that the two instruments located at the bottom of the panel are not necessary, so they will not be considered in future installations.

Dryer Felts

Dryer felts are usually made of very hard and firm material which does not stretch like woolen felts, except by wetting and drying. They are very difficult to manipulate as they are subject to such a variety of conditions. These conditions are brought about by the heat of the dryers, the moisture of the paper, the speed of the machine, etc. The felts should be equipped with automatic tighteners in which the take-up roll should be very sensitive so as to respond to all variations.

Corner rolls must always be in perfect alignment. Carrying rolls not in proper alignment with the dryer felt are sure to cause the felt to travel from one side of the machine to the other. In many cases the felt will wrinkle. These wrinkles are very difficult to remove and are such that they are usually in the felt to stay. The only sure way to care for felts is to have the rolls lined up and level, and also turned round and true. Automatic guides should also be used with dryer felts. The best result with such felts is usually obtained when a felt overhangs the dryers on either edge 2 inches to 4 inches. These edges by not coming in contact with the dryers, have a tendency to shrink a little more than the remaining part of the felt. This shrinkage makes the felt run more steadily on the machine, as it resists any influence to move the felt from one side of the dryer to the other.

The guiding of the felt and the position of the guide roll must give control over the felt. The guide roll or rolls should be placed so that the felt may be easily turned to one side or the other, and the roll following should be near enough to hold all that the guide roll has accomplished. In case two carrying rolls are placed 12 feet apart the guide roll should be placed at least 8 feet toward the roll, following the direction in which the felt is traveling. Sometimes the rolls are placed 3 or 4 feet nearer the roll in the reverse direction. Such an installation gives a very short draw from the roll as the felt approaches the guide roll, and this short distance between the roll and the guide roll, together with the unyielding nature of the felt, makes it impossible for the felt to respond quickly to the guide roll. Likewise, the felt has a long stretch to travel before passing another roll. The distance may be so great that the felt is very apt to drift back again, thus losing a part of the distance which it had been brought by the guide roll.

Automatic guides should be of such a type, and so adjusted, that a very slight pressure will be sufficient to shift the guide roll without turning the edge of the felt. The felt should run over the top of the guide roll and should incline downward slightly on either side. The guide roll should never be placed between two rolls that are very near together, or so high that the arc of contact of the felt on the roll prevents it from swinging easily.

The condition of the felt should always be known by the machine-tender so that a new felt might be in readiness to be placed on the machine whenever necessary. The new felt is led across the dryers by tying or stitching one end of it to an end of the old felt. An old felt should be carefully watched so that it does not break apart. If such a break remained unnoticed, the felt would probably catch and wind around one of the dryers, or possibly run off the machine entirely. A felt that has wound around the dryer is very difficult to remove. It cannot be unwound but is removed by cutting it off in pieces. A felt running over a machine in this manner often breaks or disables the machine.

As soon as a new felt is needed the dryers should be stopped. Then the old felt should be cut straight across that portion nearest the presses. The new felt should then be laid on the floor between the dryer and the press if the bottom felt is to be replaced, or laid across the doctor of the press if it

is the top one. It should then be seamed to an end of the old felt (where it has been cut) which carries around the dryer. The felt should be helped along and kept in alignment by a man stationed on either side of it. Care should be taken that it does not become tangled. The remaining end of the old felt should be pulled along as fast as it comes off. Sometimes it is possible to run the old felt off on the rolls, but ordinarily it is best to run it off onto the floor. A careful and reliable man should operate the dryer section so that the felt is led carefully and slowly over the dryers. Care must be taken that the felt is not run too far, as both ends of the new felt must be in the proper place to seam them together. Three or four feet makes very much difference in the seam with which this joining may be done.

In cutting the felt, both ends should be drawn up as tightly as possible, after the stretch roll has been slacked back and a roll removed. They should then be tacked to a straight edge in such a way that both edges of the felt are in perfect line with each other. The ends are then cut off after making allowance for the lap in the seam. It is also necessary that the cut follow a thread. A seam can then be made which answers very well for news, hanging, bag or manila papers.

The joining is done in several different ways. The bootleg seam or lap is made by bringing the two ends together and stitching a seam evenly across, through both plies, from 2 to 3 inches back from the ends. Slack enough for seaming is obtained by dropping the stretch roll back as far as possible and also by removing a roll or two. The seam usually comes next to the paper and is likely to give better results if one ply is cut slightly shorter than the other so that the two ends will not come squarely together. The abruptness of the two thicknesses of felt is thus reduced.

The herring-bone stitch is used on felts that are running on machines manufacturing fine book papers and the like. In this case the two ends of the felt are butted together and seamed with the herring-bone stitch. This method does away with the thick seam as given in the use of the bootleg stitch.

The stretch roll should then be adjusted in such a way that the felt runs smoothly over the dryers and rolls. Trouble may be looked for at the corner and loop rolls as they present the sharpest angles over which the felt must pass. Therefore, these places should always receive close attention.

The tightness of the dryer felt should be determined by:

1. Sufficient tension to prevent cockling of the paper.

2. Tension insufficient to leave imprint of the weaving of the felt in the paper, or to cause the felt to wrinkle.

An automatic tightener is supposed to regulate the tightness of the felt under various conditions.

The weight of the canvas used depends very largely upon conditions of the various machines.

The dryer felt rolls are commonly made of iron or steel pipe 6 to 12 inches in diameter. The size of the pipe is dependent upon the width of the machine. The rolls are usually heavily galvanized and are not turned down, as the slight irregularities in the surface of such a number will compensate each other.

Pony dryers are used to dry the felt as it passes back from the last dryer to the first. They are so placed that the felt will give its maximum efficiency at the wet end of the dryer. They are simply drying cylinders, similar to the paper dryers, but smaller in diameter (usually 24″ to 30″). The smaller dryers are run in roller bearings and are not connected with the ordinary dryer drive but revolve by the friction of the felt. Moisture, if allowed to remain in the felt each time that it made a revolution, would gradually built up a moisture content in the felt that would make it continually run wet, even at the dry end of the machine. It can, therefore, be readily seen that pony dryers are especially applicable to machines that are being operated at their limit of capacity.

The felt used should always receive a certain amount of care. Water should not be allowed to drip on the top. Chemicals, such as alum, cause a felt to disintegrate very quickly even if the drip is very small. Water should not be spattered on the felt when rinsing up the machine around the press nearest the dryers. If the dryers become clogged with paper, the machine should be shut down long enough to cut the paper causing the trouble straight across. The machine should then be started very slowly and the paper can be rolled up and removed without danger or injury. A good, strong guard should protect the dryer felt next to the press nearest the dryers. The space between the dryer felt and the press is often so small that machine operators are in danger of being caught between the felt and the first dryer.

Once upon a time, so our history tells us, a gentleman was knighted for making a good sheet of paper. Nowadays a man gets "crowned" if he doesn't.

In an article recently translated from a German paper for use in THE PAPER INDUSTRY, there is given "Seven Ways to Use Corn Starch." In going over these seven ways we discover that perhaps the most important way to use corn starch has been omitted, so let us add an eighth, namely **pudding.**

It is not necessary to be a *miser* if you want to be an *economizer.*

Cost Records, Co-operation and Common Sense

By H. M. GRASSELT

THE transfer of Esau's birthright to his brother Jacob for a dish of red pottage is the first business transaction history records. It is the first outright sale that was negotiated for the purpose of making a profit. Although it can't be said that Esau showed great ability as a business man, Jacob, on the other hand bears a decided resemblance to a "profiteer" and the whole affair was by no means conducted in accordance with our modern interpretation of a "square deal" and business ethics. Nevertheless, it marked the inception of buying and selling.

Methods have changed in the course of centuries, but the principle is just the same to-day. Business is conducted to make profit. Very few men enter it for their health's sake.

To-day the manufacturer who intends to maintain his position in the industry and expects a fair return for his investment realizes that because of ever-increasing competition, economic conditions and narrowing profits, a basic sound and dependable method of cost accounting is indispensable to the welfare of his enterprise.

The end of the war boom sounded the knell for many a cost department, but at present a healthy revival of interest in costs is noticeable throughout the industry and individuals, as well as trade associations, within the paper and allied trades work toward the introduction of a uniform method of cost accounting which is to be concise and easily understandable and will help to stabilize markets and prices and eliminate unwise quotations. Manufacturers, at some time or other, will meet competition that appears to be irrational and where quotations evidently were made in ignorance of true costs and based on estimates and guesses instead of facts. Prices quoted in ignorance of true costs will not only ultimately lead to disaster, but also unfavorably affect the operations of those that endeavor to base their prices on exact costs.

Of course market conditions and competition at all times play a considerable part in the determination of selling prices; nevertheless, the manufacturer must know how much it costs him to make his product. If his prices are always higher than the prevailing average market prices, he should realize that the cause may be found in his methods, equipment or organization. His cost system, if it is all that the name implies, should in such case indicate where to apply the remedy.

The Budgetary Cost System

The budgetary system is operated on the basis of normal costs determined by normal operation production and expenses under normal business conditions. It requires the introduction and application of standard rates* (Departmental rates, Machine Hour rates and Employee Hour rates), ascertained by computation of standard costs of supplies, labor and overhead expenses. Stores and purchase records will furnish standard costs of materials and supplies, while payroll records represent the basis for normal labor costs. Although wages frequently change, especially under fluctuating economic conditions, wage scales as a rule remain effective for at least six months.

Direct material and direct labor charges are absorbed in the cost of the product, even if operations and production fall short of the established normal standard. While these two charges naturally vary with the volume of production, overhead expenses are hardly affected thereby, since taxes, insurance and depreciation do not change whether the mill runs full time or not. Consequently, less than normal operating time will create charges not absorbed in costs. This unabsorbed burden is to be considered as the cost of idle time and will at the end of a cost period find its way into the profit and loss account.

Budgetary cost systems are being used with great success, since they offer advantages not found in systems that merely record and compute actual costs. In the first place a budgetary system represents, at all times, a definite basic standard and thus affords a complete check on operations and activities. It will point out deficiencies in methods and show a way to corrective actions. Of course, to attain the end in view, actual costs must be constantly compiled for comparison with predetermined standard costs.

Records and Gathering of Details

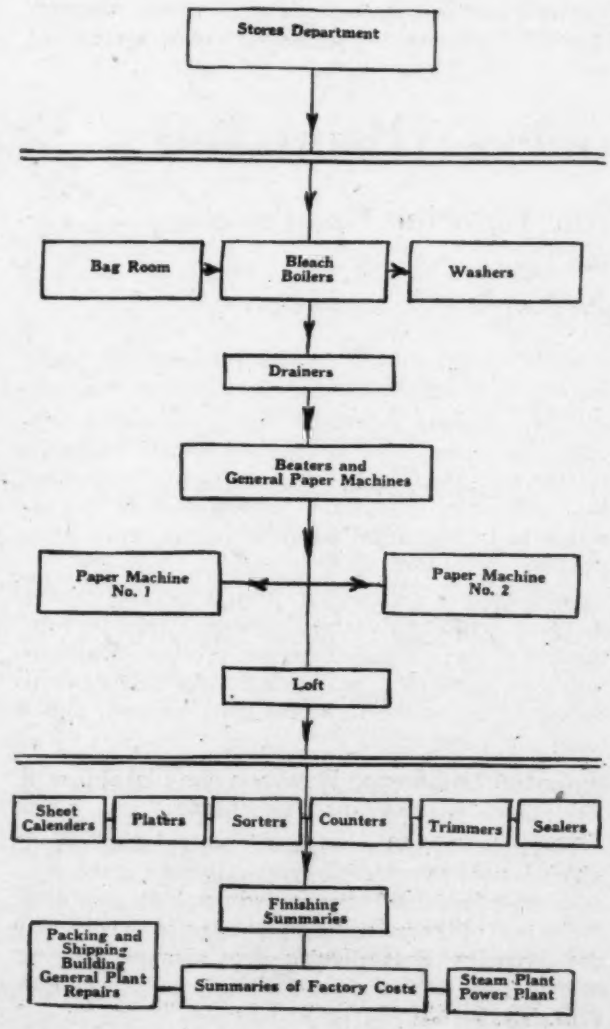
It is quite evident that collecting of initial figures plays a very important part in the determination of true costs. Without positively accurate and reliable initial data the whole system is valueless. To get results, plain and understandable forms adapted to the individual requirements are the main requisite. Properly kept they will eliminate all guess work and effectively furnish facts regarding all phases of the process of manufacture. To safeguard profits, records must be accurate and adequate and disclose defects and wastages.

The forms have to be intelligible and comprehensible to the man in the mill. The practical man with his knowledge of operations, materials and produc-

(*) See "Budgetary Control in the Paper Mill," The Paper Industry, January, 1923.

tion, is the one who can do very much toward making the cost system a success. Many a theoretically perfect system has failed to obtain its purpose, because it was too elaborate and complex; forms that had to be used for initial entries were too complicated and proved to be real puzzles to the practical man who knew how to make a fine sheet of paper, keep production up and efficiently fill his respective job, but unfortunately, was not in a position to append a string of degrees to his name.

The interspersed chart delineates the routine of the work and flow of operations to be covered by suitable records in order to obtain a complete and accurate analysis of factory costs. It is, of course, not possible in an article like this to treat in detail the individual records, their utility and purpose. It is imperative that they cover all factory activities and processes and provide for the computation of all items that go into the cost of the product so that each department or phase of production process may be charged with its exact share of the cost. Furthermore, all chargeable and non-chargeable time is to be recorded and columns provided for the entry of recoveries.



An adequate cost system also includes a stores system and a perpetual inventory of materials and finished products. Without these auxiliaries an effective material and production control will be rather problematical. Issues of materials are to be covered by "Requisition on Stores," which are summarized at the end of each cost period for entries in the material controlling accounts. (Materials roughly enumerated comprise bleached and unbleached sulphite, soda pulp, ground wood, rags, shavings, sizing and filler, in short, components of all kinds that enter into the product.)

Summaries

The final work, as far as factory records are concerned, winds up in the assembly into summaries of all records of materials and time applied to individual production periods. Those summaries will show the total factory cost of the product, to which administrative and selling expenses plus profit are to be added for the determination of the selling price.

As stated before, the correctness of initial records determines the real value of the system and final costs obtained thereby.

Are Factory Clerks Necessary to Make Cost System a Success?

While it is not good policy to burden foremen, superintendents and other plant employees with clerical work, such as the making out of cost records, the question of allotting it to factory clerks who are trained along these lines and consequently work faster and cheaper, should be very carefully considered. To solve the problem, manufacturers have to take into consideration the peculiarities of their plant and its lay-out, their facilities, the nature of their products and other conditions. Although the employment of factory clerks logically should tend to render the entire system more efficient and accurate, that addition to the clerical staff should not be made without careful consideration and then only when existing conditions make it absolutely necessary.

Up to about three years ago, when top-notch war prices permitted a more liberal spending all around, many paper mills hired factory clerks or tour clerks. Usually a few young fellows were engaged to spend eight hours a day in the mill to gather initial figures for the cost analysis; they had to weigh materials and broke and entered all details pertaining to cost factors into the records provided for that purpose. Their working hours were like those of the tour workers, and while they had to do their work in day time, they certainly took life easy after superintendents and office help had gone home. Instead of watching the movements of materials, those fellows went to motion picture shows or called on their best girls and returned only at the time their mates were due to relieve them and in order to make a few hit-

or-miss entries and inform their mates of "what's going on." The latter, after taking due cognizance, started to read the Police Gazette and other uplifting literature. Around one o'clock A. M., totally fatigued, went to sleep in a broke box. Their melodious snoring harmoniously accomanied the chants of beaters and machines till about six o'clock in the morning a sympathizing fellow called the now completely refreshed tour clerks so that they were able to "fix up" their records and wait to be relieved.

These are facts that actually took place in many mills with the office of tour clerks. However, it must be said, that other mills again obtained very satisfactory results from those employees. The comparison is drawn to show what may happen under similar condition in any mill and to emphasize, that it might be of greater advantage, to entrust foremen and other persons with the little clerical work required for the entries into the records.

To secure results, these men must be properly instructed as to the purpose of the records and their relation to the different departments and phases of production. Special emphasis must be put on accuracy. Inaccurate records are only a waste of time and money; they are misleading and may cause losses.

A certain amount of tact and diplomacy on part of the cost accountant will no doubt help greatly toward insuring results and cooperation. Semi-monthly meetings of cost men and department heads and superintendents, where individual records may be scrutinized and explained and uncertainties remedied, will prove to be of great value in cost work.

Development of Cost Work

Each plant has its own problems and peculiarities, which have to be studied in order to improve the system and correct defects and improper conditions. To install, operate and build up a cost system, that tells the manufacturer the exact cost of his product and is also a dependable indicator of plant activities and efficiency, is not so easy. It requires time and the perpetual untiring efforts of the men in office and mill. Only complete understanding of the underlying principles, co-operation and an inflexible determination to establish true factory costs through investigation and study of all factors will bring results.

This article is, of course, merely a very short outline of the principles of factory cost finding and intended for those men in the mill whose co-operation is indispensable to an effective cost system.

The Chlorine Process Discussed

The Manufacture of Pulp by the Chlorine Gas Process

By UMBERTO POMILIO

Translated from "Chimie et Industrie," viii, 41-45 (July, 1922) by A. PAPINEAU-COUTURE

THE commercial production of paper pulp by the use of chlorine gas is arousing more and more interest every day. Already several journals have reproduced my article from Chimie et Industrie of September, 1921;[1] and various pulp experts have published their opinions on the subject, among them, DePerdiguier.[2] As his article is not of a nature to clear up the fundamental ideas which are at the basis of the new process, I purpose to reply to certain of his assertions.

And I wish to state right at the start that the fundamental idea of my previous article is to prepare pulp commercially with as high a consumption of chlorine and as low consumptions of soda and of fuel as possible, which is just the opposite of what is being done at present. It is undeniable, at least as far as the Italian market is concerned, that the cost of a unit of chlorine is very much lower than that of a unit of caustic soda. And as to fuel, it is hardly necessary to mention its high cost in Italy. Under such conditions it is evidently advisable to attack the raw material with as large a quantity as possible of chlorine in its most economical form, namely, as moist gas coming directly from the cells.

I have already explained that considerable difficulty was experienced at first in treating vegetable matter with chlorine gas on a commercial scale; but that ultimately the Cataldi process enabled this reaction to be controlled relatively easily, even when working on a large scale.

DePerdiguier states that from a perusal of my previous article the Cataldi process might be mistaken for the DeVains-Peterson process, which he considers absolutely inadmissible. As far as this is concerned he adduces several good reasons, and I could add a few more.

Essential Difference Between the Cataldi and DeVains Processes

The only "chlorine process," properly so called, which is used at present is evidently the Cataldi process. The DeVains-Peterson process, both according to the text of the patent and according to the description given by DePerdiguier, uses alkaline chlorine water. or, as DePerdiguier prefers to call it, chlorine hydrate.

(1) For translation see *Pulp and Paper Magazine of Canada*, xix, 1255-1259 (Dec. 15, 1921)
(2) For translation see *The Paper Industry*, iv, 661-664 (Aug., 1922.)

The Cataldi process uses chlorine exclusively as a disincrustant. In the DeVains-Peterson process it is used especially as a bleaching agent. This is implicitly admitted by DePerdiguier in the very title of his article in which he mentions bleaching, and it is more specifically stated by Opfermann (Papierfabrikant xix, 62, Feb., 1921), who mentions the process in connection with the "bleaching of cellulose by liquid chlorine."

I was perfectly aware of the work carried out by DeVains in France since 1918; but when dealing with a process based essentially on the use of chlorine gas I did not consider it necessary to mention one based on the use of an alkali, such as the DeVains-Peterson in which the chlorine consumption is appreciably lower than the caustic soda and fuel consumptions, as we shall see further. I would be very curious to know the tests carried out in France on the use of chlorine gas as a disincrustant, to which DePerdiguier refers at the beginning of his article; and if there had been a bibliography available on the subject I would not have failed to mention it.

DePerdiguier to the contrary notwithstanding, contends it is undeniable that commercial tests to find a method of disincrusting vegetable materials by means of chlorine gas failed, chiefly owing to the impossibility of getting a uniform product with constant consumption of raw materials. It was for this reason that DeVains attacked the problem from a different angle.

All this agrees perfectly with what I have written about the chlorine gas process when I referred to the numerous difficulties which arose, entirely apart from the theoretical principle on which the method is based, and which was overcome only after years of work. It is a fact that these difficulties have been overcome, and that in using chlorine gas instead of caustic soda the Cataldi process has finally achieved what the other processes failed to do.

Elimination of Hydrochloric Acid in the Cataldi Process

The Cataldi process does not use any of the methods previously tried to overcome the drawbacks due to elevation of temperature and to formation of large quantities of hydrochloric acid. By a method which is as simple as it is original, the hydrochloric acid is eliminated during the chlorination stage and at the same time the temperature of the system is lowered. Therein lies the whole secret of the success of the process. The chlorination can be regulated by very simple means, and hence also the rate of the reaction, the temperature and the concentration of the hydrochloric acid. Evidently I cannot divulge how this end is reached; but from the mere fact that I have shown that it is reached, the whole of DePerdiguier's theoretical demonstration of the effects of temperature and hydrochloric acid concentration during chlorination comes to naught.

As to the arguments brought forward to prove the high concentration of hydrochloric acid and the high temperature which may be reached by chlorinating with chlorine gas, I may add that it is not at all necessary that in chlorinating on the commercial scale the material should contain an equal weight of water, for it can contain either more or less, as I have observed in actual operations. The hypothesis according to which half of the chlorine is fixed by the non-cellulosic matter and the other half is converted into hydrochloric acid is also inexact. As a rule, much more than half of the chlorine, sometimes as much as 80%, is converted into hydrochloric acid. So that things would be even worse than DePerdiguier imagines if the hydrochloric acid were not eliminated. I had brought this out quite plainly in the equations:

$$Cl_2+R.H=HCl+R.Cl$$
$$Cl_2+H_2O+R.CHO=2HCl+R.CO_2H$$

The figures which I had quoted from Cross and Bevan, and on which DePerdiguier bases his calculations, refer only to jute, which was chosen by these authors for the very reason that in this case the cellulose is accompanied by a typical ligneous complex, which can be perfectly chlorinated. But in this case much more than 50% of the chlorine is converted into hydrochloric acid, and the same is also true of many woods, and also of hemp stalks on which DePerdiguier bases his calculations and with which I have experimented for a long time.

I shall merely recall that Cross and Bevan describe in detail the chlorination of fir wood. In this example 75% of the chlorine consumed is transformed into hydrochloric acid; Heuser (Z.angew.Chem., Dec. 26, 1913), is of the same opinion, as is also Dr. Cerruti (Giorn.Chim.Industr.Appl., Feb., 1922, p.67).

Consumption of Raw Materials

It is quite interesting to learn from DePerdiguier that the DeVains-Peterson process requires a consumption of about 20 to 25 kilos of unrecovered soda per 100 kilos of straw pulp produced, and 8 kilos of chlorine in aqueous solution, under pressure (6 grams of chlorine per liter), which involves a by no means negligible complication. As to the fuel consumption, it is not mentioned; but it must certainly be more than the 15 kilos required for the chlorine gas process, when we consider that in the alkali-chlorine water process the material is digested under pressure for four hours while in the chlorine gas process there is no such cooking. These figures prove most eloquently that such a process, far from helping to relieve the present overproduction of chlorine, actually makes it worse.

A doubt might be raised, however, as to the commercial practicability of the chlorine gas process, and DePerdiguier did not forget to do this. In case what I have said should not be sufficient proof, I shall quote what other technicians have written on

the subject after visiting the mills where the process is actually used.

Opinions of Other Experts

Dr. Cerruti, who cannot be accused of being over-optimistic with regard to the Cataldi process, says:

"As far as the yield of wood cellulose is concerned, commercial-scale tests have confirmed our previous knowledge of the chlorine process as an analytical method for the determination of cellulose in plant materials. Of all the known processes the chlorine process gives the highest yield; in other words, with all the other methods part of the cellulose is destroyed by the action of the chemicals; but with chlorine this does not take place, or takes place only to a very limited extent. Coupled with this is the extremely important fact that the properties of cellulose obtained by the chlorine process are less impaired than when obtained by any other process. This can be obtained only by careful regulation of the action of the chlorine; but this can easily be done with a little practice and care."

On the other hand, Leskovic, who has specialized along this line, does not hesitate to say that "it must be granted that the Cataldi process has solved perfectly the problem of the commercial treatment of vegetable materials by means of chlorine gas, as regards both equipment and method of treatment."

Finally, Prof. C. Levi, who tested officially the commercial pulps produced by the chlorine gas process, concludes his report as follows:

"We consider it advisable to publish the properties of this pulp.

"The whiteness and purity of the poplar are comparable to those of the best commercial bleached pulps. The usual reagents for lignified fibers gave no reaction, which shows that the incrustants have been completely removed. The ash content is 1.7% and the pulp contains 74% of alpha-cellulose and 21.1% of beta—and gamma—celluloses. The fibers are mostly isolated or gathered in bundles. Their morphological characteristics are those of ordinary poplar cells. Along with the fibers are the characteristic vessels. The microchemical properties are the same as those of completely disincrustated cellulose, thereby confirming the absence of lignin. The fibers are not broken, but are full length, and it is only occasionally that a few fragments are found. The length varies from 0.7 to 1.6 mm., with an average of 1.1 mm.; and the diameter varies from 0.01 to 0.03 mm. with an average of 0.026 mm.

"We prepared hand made sheets from pulp which had been merely disintegrated in the beater, and tested the felting quality and strength of the pulp, taking into consideration the natural properties of poplar fibers and their small size.

"The samples examined differed appreciably in external appearance from ordinary poplar sulphite; they were more rigid and had a tendency to be transparent. From our observations we conclude that chlorine pulp can be used advantageously in the manufacture of various grades of white papers, especially when mixed with other fibers in proportions varying with the grade of paper required.

"The samples of hemp stalk pulp examined at the Experimental Station were of a brilliant white, which was not inferior to that of good grades of commercial bleached pulps. The stalks had been well disintegrated, and the pulp contained but very few small shives which could be easily removed by careful screening. Testing with the usual lignin reagents and microchemical examination both showed that the lignin had been completely eliminated.

"The morphological characteristics of the pulp are those of hemp stalk cellulose: short fibers having a maximum length of 0.75 mm., minimum of 0.5 mm., and average of 0.65 mm., and a diameter varying fro 0.03 to 0.012 mm., with an average of 0.02 mm.

"Most of the fibers are completely separated, only a few bundles being bound, and there are various other vessels and elements.

"The samples contained 3% of ash and consisted of 71% of alpha-cellulose and of 29% of beta-and-gamma-celluloses.

"The tensile strength of hand made sheets prepared from pulp which had been disintegrated in the beater was satisfactory, when the shortness of the fibers is considered. The sheets were very rigid and appreciably transparent.

"From our observations, we consider that hemp stalk pulp produced by the chlorine process lends itself to the manufacture of different grades of paper, in admixture with other fibers. We would advise that this pulp be produced and manufactured into paper on a commercial scale, using different percentages of hemp stalks in admixture with other fibers, so as to study its behavior on the paper machine and see what qualities it imparts to the paper."

Conclusions

We can sum up by saying that the Cataldi process gives a good yield, that the quality of the product is perfect, and that it permits of using a maximum amount of chlorine gas and a minimum of alkali and fuel, thus solving the problem of finding an outlet for the over-production of chlorine. It is actually the only commercial process which can solve the apparently insoluble problem of using chlorine on a large scale and as a paying proposition for the production of a widely-used commodity, paper pulp.

The Use of Chlorine in the Manufacture of Paper Pulp

By C. ARDISSON DEPERDIGUIER

(Translated from "La Papeterie, xliv," 886-873, Oct. 10, 1922, by A. Papineau-Couture)

In the July 1922 number of Chimie et Industrie, Pomilio publishes an article on "The Manufacture of Pulp by Means of Chlorine," which is quite polemical in tone. Dr. Waentig, in an article published in the

June 11, 1922 number of Der Papier-Fabrikant, reviews the various processes in which chlorine is used, and gives due consideration to the Cataldi process; but, less exclusive than Pomilio, he classes as chlorine processes all those which use this substance for the delignification of cellulosic materials, whether it be used as chlorine gas, as chlorine hydrate, or in the form of a chlorine compound.

Pomilio claims that the Cataldi process is the only one which really should be called "chlorine process." As far as I am concerned, I am quite willing to grant this if by "chlorine process" is meant that which requires the greatest consumption of chlorine irrespective of the results obtained. It is quite evident that from this standpoint the process so stoutly defended by Pomilio stands unrivalled. The Cataldi process presents the undisputed originality of solving the problem of the overproduction of chlorine, which is worrying Italian electrochemists to such an extent. But up to now it does not seem to present much interest outside of Italy: it merely gives a solution to a special case of the problem.

If the practical results obtained by the Cataldi process are confirmed otherwise than by the personal assertions of Pomilio, I readily admit that it will certainly mark an advance in the technique of the utilization of chlorine in the manufacture of pulp; for if it succeeds in reducing the consumption of caustic soda it will be particularly interesting in Italy, which offers a good market for caustic soda but a rather poor one for chlorine.

But in France and other countries the fears voiced by Brochet in his book on "Electrolytic Soda" concerning the overproduction of chlorine have not been realized. The dyestuffs industry requires a considerable amount of chlorine, and the value of this product has been maintained so well that its production has always been a paying proposition, so much so that electrolytic chlorine plants built during the war have not experienced any undue difficulty in marketing their output during the last three years, and many of them have modernized their equipment and even expanded.

Quality of Pulp Produced by the Cataldi Process

In his article Pomilio quotes extracts from the report of analyses made by Professor C. Levi of the Experimental Station. At first sight the results of analysis might appear favorable; but reading between the lines will show the value of such statements as: "The samples examined differed appreciably in external appearance from ordinary poplar sulphite; they were more rigid and had a tendency to be transparent." A little further Prof. Levi says: "The sheets were very rigid and appreciably transparent."

The microphotograph published by Pomilio shows a few bundles of fibers, which will not escape the notice of paper makers, for they know that fibers bundles cause trouble, especially in the manufacture of fine papers. These bundles prevent the proper felting of the stock on the wire, and, what is even worse, they are liable to cause "light spots" in heavily calendered paper. For instance, during the war some English mills tried to substitute straw for esparto in their furnish, and in spite of the fact that they were thoroughly proficient in the manufacture of paper they experienced considerable trouble. I am therefore inclined to think that though the Cataldi process yields cellulose, the latter possesses the defects and presents the drawbacks which have always been found in products obtained by the treatment of vegetable materials with chlorine gas.

We are thus faced by two facts, (1 a large consumption of relatively expensive chlorine, and (2) production of a pulp which is not suitable for the manufacture of fine papers. This limits the usefulness of the Cataldi process to two Italian mills which are both placed in exceptional circumstances, one of them being an experimental mill and the other being operated in connection with a large electrolytic soda plant.

Our conclusions are further strengthened by the fact that, though the process started being worked in 1917 and a lot of noise was made about it, both in Italy and in other countries, the total production by this process is only a few tons a day.

If the value of a process is judged by the results obtained and by the extensiveness of its application, the Cataldi process certainly cannot be compared with other processes which have been developed since the war, and more particularly with the DeVains process which is actually being worked in four mills producing 50 tons of pulp a day, while three other mills are at present under construction, one in France, one in Belgium, and the third in the Dutch Indies, which will produce as much as is already being produced.

Those who have worked on the problem of the production of cellulose by means of chlorine know that the chlorine consumption may be greatly increased if desired, even up to 70% of the pulp produced, just as well with the DeVains as with the Cataldi or any other process. It must not be forgotten, however, that the soda consumption depends not only on the nature of the raw material, but also on its silica content. Chlorine can never dissolve out the silica, and Pomilio furnishes figures for the treatment of poplar, which contains very little silica. But for the treatment of straw, even by the Cataldi process, a definite minimum amount of soda is required; and for this reason, in Italy, the Societa Italiana di Elettrochimica, which is equipped for the production of 20 tons of pulp a day, has preferred the DeVains to the Cataldi process. It considers it preferable to use the required amount of soda in spite of its relatively high price so as to obtain a high grade pulp

which can sell at a high price; rather than try to use a whole lot of chlorine and very little soda which gives an inferior grade of pulp. And this does not prevent the use of a large amount of chlorine if desired, without impairing the quality of the pulp in any way. I have a sample of paper made by one of our well-known manufacturers of fine papers, which consists of 30% of ordinary sulphite, 10% new cotton, 10% broke, 40% straw from the Bussi mill, and 10% filler. The breaking length is 3,675 meters and elongation 3%. It is the first time that paper containing such a high percentage of straw was ever manufactured in France. But tests are being carried out on a large scale, and very soon we will see papers containing 70% of straw pulps.

If you don't love your job, don't worry about it; some other fellow will soon have it.—Drake Hustler.

Power Plant Management

Fixed Charges and Maintenance

By ROBERT JUNE, M. E.

FIXED charges of the power plant are made up of a number of separate items, such as depreciation, interest on investment, rent and administration. Maintenance consists of renewals and repairs, and the necessary labor required to make them.

Depreciation

Depreciation results from a decrease in value of a given piece of apparatus, as a result of wear and tear, age, changing plant conditions, and changes in the art of manufacture of the particular apparatus which renders its further use inadequate. A convenient classification of the various forms of depreciation follows.

Complete Depreciation—This results from a gradual and even decrease in value, as the result of wear and tear.

Obsolescence, Inadequacy and Destruction—Marked improvements in the design of certain types of apparatus may render the use of the older type uneconomical, thus prematurely shortening its life.

Inadequacy is the result of increased demands upon capacity, which renders it necessary to discontinue the use of a given machine, or the result of changing plant conditions which render the services of a machine of a given type no longer necessary.

Destruction is the result of accident. The possibilities of accident should be covered by insurance as practicable. As they cannot be anticipated, it is difficult to set up a proper reserve for them. Obsolescence and inadequacy can, at times, be anticipated, and when this is the case, definite reserves should be set up to compensate for them. Whether there is reason to expect them or not, some reserves should be set up in these days of rapid developments in the mechanical arts.

Incomplete Depreciation—This is due to unusual wear and tear of the sort which is apt to fall at irregular intervals in large amounts. Depreciation may be handled by several methods, as follows:

1. To charge to earnings in good years and credit to depreciation such amounts as the profits from the operation permit.

2. To charge to earnings the depreciation as it matures and necessitates renewals.

3. To charge to earnings and credit to depreciation reserve annually a certain percentage of the cost determined by the average weighted life of the property.

It is quite common practice in power plant work to set up an average annual depreciation and allowance, based on the original cost of the equipment, less its value as junk or salvage, and to spread this depreciation over a period of years approximating the assumed life of the equipment. Table I gives the approximate useful life of the most common type of power plant equipment, based on the assumption that they are properly handled and cared for, and that maintenance and repairs are kept up. This table does not account for obsolescence or inadequacy, and its figures should be discounted on this account.

TABLE I

Approximate Useful Life of Various Portions of Steam Power Plant Equipment

	Years
Belts	8
Boilers, water-tube	25
Boilers, fire-tube	20
Buildings, brick or concrete	40
Buildings, wooden or sheet iron	15
Chimneys, self-sustaining steel	30
Chimneys, guyed sheet iron	10
Condensers, jet	25
Condensers, surface	20
Coal conveyor, bucket	15
Coal conveyor, belt	10
Engines, slow-speed	25
Engines, high-speed	20
Economizers	20
Generators, direct current	20
Generators, alternating current	20
Heaters, open	25
Heaters, closed	20
Motors	20
Pumps	20
Piping, ordinary	12
Piping, first-class	20
Rotary converters	20
Soot blowers	8
Storage batteries	15
Stokers	12
Turbines	25
Transformers	20
Wiring	15

If we consider depreciation as including maintenance, we should properly set aside as a reserve a fixed percentage for the decreasing value of the equipment to represent the unmatured depreciation. In this way we equalize matters by making the depreciation allowances larger when repairs are smallest and vice versa, depreciation smallest when repairs

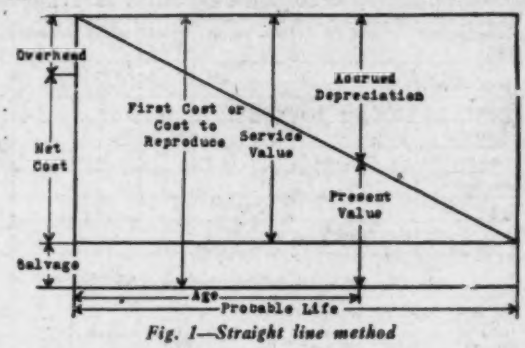


Fig. 1—Straight line method

are largest, as the end of the useful life of the equipment approaches.

Depreciation reserves may be accumulated, therefore, either on the "straight line" or "sinking fund" method.

Straight Line Method

In the straight line method, if we assume that the total investment, less salvage, is divided by the expected life of the equipment, we will have the amount in money which should be allowed each year to cover the accrued depreciation. This is the simplest method. It is illustrated in Figure I. Probable age of equipment may be determined from Table I, with discounts as noted, to take care of obsolescence and inadequacy. In utilizing this method, the original cost is considered as including the net cost of labor

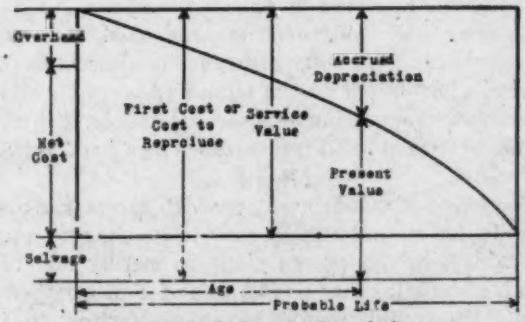


Fig. 2—Sinking fund method

and material, plus overhead, which includes insurance charges, fire and liability insurance, interest on investment during construction, installation, and, where the entire plant is being built, financial, legal and organization expenses.

Sinking Fund Method

In utilizing the sinking fund method, we set aside a fixed sum per annum, which must be allowed to accumulate at compound interest. The money thus set aside, plus accumulated interest, must be equal to the original cost of the equipment, less salvage value, at the end of the assumed life of the equipment. Again we have reference to Table I for the life of the equipment, and again we must make proper discount for obsolescence and inadequacy.

Figure 2 graphically illustrates a convenient method of determining the rate of depreciation in connection with the use of the sinking fund. Table II may be conveniently used in this connection.

TABLE II

Rate of Depreciation—Per Cent of First Cost

Assumed useful life	Rate of Interest, Per Cent						
Years—	4	4.5	5	5.5	6	7	8
2.....	49.02	48.90	48.78	48.66	48.54	48.31	48.07
3.....	32.03	31.87	31.72	31.56	31.41	31.10	30.80
4.....	23.55	23.39	23.20	23.03	22.86	22.52	22.19
5.....	18.46	18.28	18.10	17.19	17.73	17.40	17.04
6.....	15.08	14.89	14.70	14.53	14.33	13.97	13.63
7.....	12.66	12.46	12.28	12.09	11.91	11.15	11.20
8.....	10.85	10.66	10.47	10.28	10.10	9.74	9.40
9.....	9.45	9.26	9.07	8.88	8.70	8.34	8.00
10.....	8.33	8.14	7.95	7.76	7.58	7.23	6.90
11.....	7.41	7.22	7.04	6.86	6.68	6.33	6.00
12.....	6.65	6.46	6.28	6.10	5.92	5.60	5.27
13.....	6.01	5.83	5.64	5.47	5.29	4.96	4.65
14.....	5.46	5.28	5.10	4.93	4.75	4.49	4.13
15.....	4.99	4.81	4.63	4.46	4.29	3.97	3.68
16.....	4.58	4.40	4.22	4.06	3.89	3.58	3.30
17.....	4.22	4.04	3.87	3.70	3.54	3.24	2.96
18.....	3.90	3.72	3.55	3.39	3.23	2.94	2.66
19.....	3.61	3.44	3.27	3.11	2.96	2.67	2.47
20.....	3.36	3.10	3.02	2.87	2.71	2.44	2.16
25.....	2.40	2.24	2.09	1.95	1.82	1.58	1.36
30.....	1.78	1.64	1.50	1.38	1.26	1.06	0.88

Interest on Investment

Interest on investment should cover not merely a percentage of the original net cost, but it should also include overhead, such as insurance, engineering fees, office charges, cost of superintendence, interest on money paid in advance of the operation of the equipment, etc., the point being to include everything which enters into the expense of putting the equipment into service.

If the equipment, or building, in the case of a complete power plant is covered by mortgages, or bond issue, the interest rate must be high enough to include the complete interest on the mortgage, or bond, as well as any differential between the total gross cost and the amount of the bond or mortgage.

If the new equipment or building is paid for out of surplus previously earned in the business, interest should be charged at the rate which the money would earn if invested in other branches of the business, or which it would earn if placed out at interest.

At this point it is well to draw a distinction between repairs and renewals on one hand, and additions on the other. Repairs and renewals which do not increase the value or efficiency of the equipment beyond its former value must be charged to operating expenses. Additions, such as accessories which increase the value of the equipment, should be considered as capital investment. In the case of obsolescence or inadequacy, which has not been anticipated or entirely charged off in former years, only that portion of the cost of replacement above the cost of renewal of the old equipment should be

charged to capital value. The remaining depreciation which has not been anticipated, must be charged to operating costs.

It should also be remembered that as depreciation occurs capital value declines, so that the amount of interest set aside each year will be less as time goes on.

Insurance

Three classes of insurance are usually required in the power plant. First, on the building; second, on equipment; and the third, liability insurance on employees. On the first two classes, the premium is in direct relation to the value of the plant and equipment. The premium on the third class bears no relation to the cost of physical equipment, being based on the cost of labor and the hazards of employment.

Proper Insurance—The relative premium on building insurance remains approximately the same year after year. However, it is extremely important to remember that when additions or alterations are made to the plant, that additional insurance should be provided. Changing replacement values of plant and equipment should also be taken into consideration. Thus, a building erected in 1912, for example, of good construction and with an estimated life of 40 years, would, in 1920, if building costs had remained the same as in 1922, be properly insured for three-fourths of its original cost. However, as building costs have approximately doubled in the past ten years, the insurance should be based on the replacement cost today, less depreciation, which would mean that the building should be insured at 1½ times its original cost.

Changing hazards must also be taken into account. If the fire hazard increases, the insurance companies will be found to be very prompt to cancel the policies in force and place in effect new ones at higher premiums. Should the fire hazard decrease, the owner should have the old policies cancelled and new ones issued, based on the lessened risk.

Equipment Insurance — Equipment insurance should be based on replacement value just as in the case of building insurance. If old machinery is replaced by new, the policy should be revised to take this new value into consideration in order to secure adequate protection.

Liability Insurance—Liability insurance has come to assume a very important place in power plant costs. The premium, as a rule, is based on the pay roll, being divided however into a number of sections, each carrying a different premium depending upon the hazards of the individual class of work. As the premium may run anywhere from one to ten per cent of the actual cost of labor, it forms a very important item and should not be neglected.

The first point is to ascertain the exact amount of time put in by the various power plant employees on various classes of work, bearing different premiums. For this purpose a daily report similar to that shown in Figure 3 is desirable. This, in addition to serving as a check on insurance premiums, may also be used for purposes of efficiency study in order to determine whether any undue proportion of time is being put in on certain classes of work.

In going into the various classes of insurance in detail, our purpose is to point out that insurance is

Description	Rate per hr.	Total hr.	Amount $	Remarks
Asst. Engrs.				
Oilers				
Firmen				
Coal Passers				
Watchmen				
Other help				
Total Gross Labor Cost (A) $				
Deductions for Maintenance to Power House Equipment				
Description of Work				
Name or No. of Equip. / Kind of Work done. State Whether Repair or Renewal	Name of workman	Rate per hr.	Total hr.	Amount $
Total Deduction for Power House Maintenance (B) $				
Deductions for Construction and Repairs not for Power House				
Description of work				
Location / Kind	Name of workman	Rate per hr.	Total hr.	Amount $
Total Deductions for Out of Power House Labor (C) $				
Grand total deductions for labor for non-operating purposes (B + C) $				
Net labor attendance costs A-(B + C) $				

Fig. 3—Daily report sheet for power plant labor

much more of a variable than is generally supposed and that the insurance costs for a given period should not be assumed to be in definite relation to liability but that they should be ascertained exactly for the period covered by the cost analysis.

Building and equipment insurance is, of course, a fixed charge. Liability insurance is sometimes considered a part of the cost of labor and is simply added thereto as an operating expense. However, it is more simple to regard liability insurance as a fixed charge.

Rent

The value of the ground on which the power plant is built determines the amount to be charged up to rent. Where the power plant is merely one of a group of buildings, as in the case of a factory power plant, the rental should be in proportion to the amount of ground occupied by the power plant, coal pile, etc., as compared to the other buildings. Where the power plant stands alone, as in the case of a central station, the value of the entire real estate is a base for rental charges. Here again we have to take into consideration changing real estate values. However, adjustment and rental charges need ordinarily be made not oftener than once a year.

Administration Expenses

This covers such items as salaries of officers, clerical wages, office supplies, office rent, interest

and depreciation on equipment, depreciation and repairs on office equipment, insurance on office equipment, postage and stationery, telephone and telegraph legal expenses, and where power is sold as well, advertising and sales expenses. In the case of a central station, all of the above items should be charged against the cost of producing power. If the central station has other lines of activity, they must be proportioned in relation to the expenses incurred by the various departments of the business.

In the case of a factory power plant, power becomes a production expense and the overhead charged against the power plant should be in relation to the total investment, and also to the total labor expenses in the factory and the total labor expenses in the power plant.

With uniform production, administration expenses will ordinarily vary but slightly from month to month. It should be ascertained each month and figured into the cost of power. Right at this point, the writer enters the plea that the men in actual charge of the production of power be regularly supplied each month with a statement from the accounting department showing all the charges set up against the power plant for interest, depreciation, insurance, rent, administration expenses, and maintenance. These figures are all too commonly regarded as a secret. Just why this is so is not clear. The figures are usually of not the slightest value or interest to any one outside the plant nor would their possession by the operating men embarrass the management in 99 plants out of 100. Giving the operating men these figures indicates first, confidence in the integrity of the men and secondly, confidence in their ability to suggest ways and means of reducing some of these charges. Finally, it tends to curtail waste and extravagance where such exist.

Figure 4 indicates a form of record which should be kept in the power plant, one sheet for each important piece of equipment. This is not a formal accounting record—its purpose is to keep the men in charge of power plant operation fully informed of the nature and extent of the investment and the various types of equipment and the cost of operating each individual unit. Its value will depend upon the individual men and their interest in their work.

Figure 4

Fixed Charges

Type of Equipment.....

Plant No..... Building No.....

Location .....

Manufactured by.....

Address .....

Date installed.....By whom.....

Brickwork and foundation put in by.....Date.....

	Total Investment to date	Interest on investment at ——% annually	Depreciation at ——% annually	Rent (based on proportionate space in bldg. occupied by each machine)	Overhead (based on proportionate share of taxes, insurance, office expenses, etc., for each machine)	Total annual fixed charges
Cost of Foundation.....						
Cost of Setting.....						
Cost of Boiler.....						
Cost of Installation.....						
Total Original Investment.....						
ADDITIONS. (Do not charge wages of regular plant attendants whose time would go on anyway, against additions.)						

Date	Character	Material furnished by	Cost	Labor by	Cost						

Maintenance

Maintenance and repair cost records should also be kept in the power plant. Again, this is not for formal accounting purposes. Its value to the operating men is to tell them where they are at with respect to the cost of maintenance of various types of equipment. Maintenance, of course, refers to the expense of keeping the plant in running order over and above the cost of attendance. It does not refer to the replacement of new units but it includes the cost of keeping plant attendants, whose time would go on anyway whether they were engaged on repair work or not.

Figure 5 offers in convenient form a means of keeping track of the maintenance costs in the power plant. One of these sheets should be used for each machine of any size and the accounting department instructed to place at the disposal of the operating men any needed information regarding the costs, which will enable them to keep those records with approximate accuracy.

Figure 5

Maintenance Cost Record

Type of Equipment.....
Plant No.....Building No.....
Location .....
Manufactured by.....
Address .....
Name and address to call re repairs.....
Date installed.....By whom.....
Brickwork put in by.....

Repairs

(Do not charge wages of regular plant attendants, whose time would go on anyway, against repairs.)

Date	Character	Material furnished by	Cost	Labor	Cost	Total cost repairs to date

Pointers for the Engineer

By W. F. SCHAPHORST, M. E.

Saving Money "At the Source"

WHERE an automatic damper regulator is not used in the paper mill power plant a fluctuating steam pressure is bound to be the result. Fluctuations are not only bothersome throughout the entire plant, but they also cause a considerable waste of fuel. For every pound that the steam pressure exceeds the required amount, its equivalent in fuel is wasted. This is due to higher chimney temperatures, higher steam temperatures, etc. And for every pound that the steam pressure falls below the required amount an extra fuel supply is needed to force the fire and build up the pressure.

The steam turbine, the centrifugal pump, the electric generator, etc., have proved to the world that the "steady sustained effort" is superior to the fluctuating reciprocating effort. Automatic regulation should be maintained at a steady even rate. When loads vary the combustion rate should be made to vary correspondingly. There is no better method of control either for steady or fluctuating loads than via the automatic damper regulator.

The high grade automatic damper regulator earns money every minute of the day and night for its owner by making fuel costs less. It relieves the fireman of all irksome duties pertaining to the operation of the boiler dampers. Besides, automatic operation in this case is far more efficient and economical than is possible with the very best of manual regulation. This is true also in the case of scientific boiler feed regulation, turbine operation, stoker operation, pump operation, etc. Automatic damper regulation is surely as important as any of these as it saves fuel at the source, where most fuel can generally be saved.

Chimney Gas Temperature as an Indicator

IT is not as well known as it should be that the temperature of chimney gas is an excellent indicator of boiler efficiency. In other words, a boiler's efficiency may be closely approximated by simply putting a thermometer in the chimney and taking the temperature of the exit gases. I have found after studying many reports of actual tests, that regardless of the make or type of boiler the results obtained are fairly consistent in every case.

To be sure there are other losses beside temperature losses, such as the loss due to moisture in the air, due to CO, due to radiation, etc., but according to statistics these losses seem to be fairly constant in the average plant, whereas the losses due to scale and soot are the variable losses and in general are the principle causes of high flue gas temperatures. Moisture in coal, hydrogen in the fuel, moisture in the air, combustible matter in the ash, radiation and convection, do not influence chimney gas temperature as markedly and as regularly in the average boiler plant as do scale and soot.

Some years ago when gas and oil engines were fairly new on the market a scientist came out with a method for determining the efficiency of an internal combustion engine by simple analyzing the exhaust gases. It was claimed that his method was surprisingly accurate and the writer can see no reason why it should not be.

In the case of steam power plants there is no question but that boiler efficiency could be very accurately determined by first making a careful analysis of the coal, and then a careful analysis of the

chimney gases, together with the temperatures of all products entering before combustion and the temperatures of all products leaving through the chimney. The difference would be the heat going through the steam pipe plus the radiation losses together with a few other minor losses. However, such a method would be too tedious and impractical. The engineer who wants a good rough indication of his boiler efficiency would rather simply look at his chimney and take a single reading—the reading of the chimney gas temperature.

Eliminating Spontaneous Combustion

A METHOD that is said to give good results in preventing spontaneous combustion is to dump the coal in such a way that it will not roll. That is, do not dump it from one point as from a crane onto a conical pile. By dumping from one point the large lumps invariably roll down one side and the fine coal is separated from the coarse. It is better to dump it in such a way that this separation does not take place. It may be more expensive to dump coal carefully, but it has been found to be well worth while. By avoiding the separation of large from small particles all of the spaces are filled up so that air does not filter into the coal bed. It is the infiltration of the air between the large lumps that is usually the cause of spontaneous combustion. Because of this fact fires usually start near the "edge" of the pile amongst the large lumps and not inside where the air is excluded.

Some Unusual Pipe Bends and Welds

SOMETIMES it is impossible to make pipe bends that will fit into existing paper mill plant conditions. For example, a bend was wanted in a 24-inch pipe, the offset to be 21 inches, and the length face to face 10 ft. 5 inches. It was specified that the bend had to be made close to one end—an impossibility as ordinarily done with a pipe 24 inches in diameter. As a result it was decided to make a "welded bend," as sketched in Fig. 1, herewith. Square lap vanstone joints were provided at each end as shown.

The only objection to a bend of this kind is the more abrupt bend—the "corners" in the bends—and the possibility of the creation of eddy currents. Several years ago welded joints were objectionable, but today they are made just as strong and even stronger than the solid plate. Besides, the welded joint is smoother on the inside and causes less friction.

Fig. 2 shows another unusual pipe connection—a combination welding and swaging job. The 24-inch pipe was swaged down to 20 inches and was then provided with a square lap vanstone end of standard 20-inch size. The 20-inch outlet shown at the top was welded in place, it, also, being equipped with a square lap vanstone joint end.

Swaging pipe down in this manner has a number of advantages over other methods. If reducing fittings were used instead, the friction would be greater, more space would be required, there would be greater danger of leaks due to the greater number of joints, the completed job would not look so good,

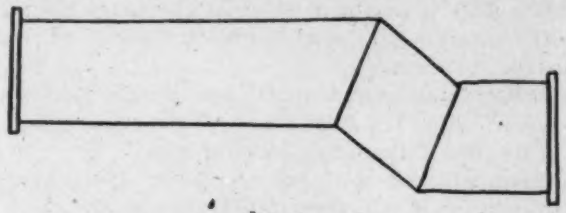


Fig. 1

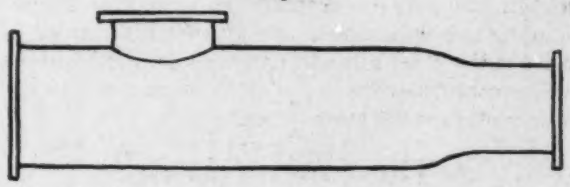


Fig. 2

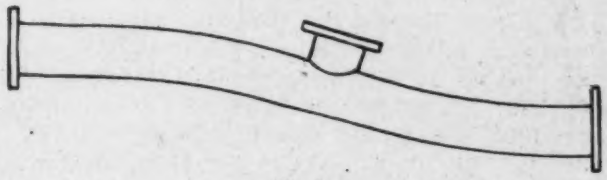


Fig. 3

and last but certainly not least, the cost with fittings would be greater. Besides, as has been proved by actual tests, the vanstone joint is far superior to ordinary joints involving pipe fittings.

Fig. 3 is an unusually long bend made from 18-inch pipe. It is 21 ft. 6 in. from face to face, has a 10⅞" offset bend and close to the center a 10-inch nozzle is welded in place as shown. If one were to attempt to make this job out of straight pipe and fittings, it is evident that the result would be a clumsy-looking affair, it would cost more, and it would be far less efficient and safe.

Carbon Dioxide Recorders

WHEN such a thing as a CO_2 recorder is mentioned to the average engineer he is liable to take on a confused air because he doesn't know what CO_2 means, and feels that he is wading in beyond his depth i nattempting to converse on such a subject. CO_2 belongs to the realm of chemistry and not in engineering according to the notions of the average engineer.

There is nothing really complex about a CO_2 machine however. The engineer doesn't necessarily have to know anything about chemistry, even though combustion is a chemical process. He needn't even know what the chemical symbol CO_2 means. Continuous records are now made by a reliable machine

that works automatically as long as it is in working trim. To keep the machine in order is not a problem of chemistry, but one of mechanics, or perhaps some engineers would prefer to call it "engineering" in which case the engineer will fit into the job very well. Many engineers—thousands of them perhaps—are daily attending to their CO_2 machines and recorders and are doing their work perfectly. Yet they don't know any more about chemistry than any other average man who has never dabbled in chemistry.

Should you install a CO_2 recorder in your plant you will find it a good plan to instruct several men in its care if there are "several men." There is no reason why the chief engineer alone should be able to care for it. In fact, it is better for the chief to assign the duty of keeping the analyzing machine a-going to a subordinate and make it his regular job. Should the chief attend to all such details himself he will certainly overlook them on days when he considers other work more important.

The Cost of Leaks

ACCORDING to a poster displayed by the Rock Island Railroad the total cost per month of wasted air at 10c per 1000 cu. ft. is: $997.92 through an opening of 3/8" diameter; 1/4" $444.96; 1/8", $111.46; 1/16", $27.86 and 1/32", $6.96. Steam at 60c per 1000 lb. costs: 3/8" opening, $276.00; 1/4", $121.80; 1/8", $30.30; 1/16", $7.65; 1/32", $1.91. Water at 15½c per 1000 gal. costs; 3/8" opening, $108.00; 1/4" $48.00; 1/8", $12.00; 1/16", $3.00; 1/32", $.80.

Feeding the Boiler

INTERMITTENT boiler feeding is undesirable. This is so because in the first place, the periods of such feed are never, except by accident, in synchronism with or in proportion to the relation between furnace heat and boiler load. Turning on the feed water supply always entails a sharp increase in demand for heat from the furnace to heat up this water to the boiling point, while turning it off sharply reduces this demand. Where this turning on and off is done arbitrarily, it is likely to result in wide fluctuations in the steam output of a boiler directly the reverse of what the load calls for. Secondly, on account of the use of economizers, feed water heaters, water softeners, modern metering instruments, etc., a continuous rate of feed is necessary that these apparatuses may operate to the best advantage.

The best authorities now recognize that when the load suddenly increases on a boiler, it is desirable temporarily to decrease the rate of feed water supply, and on the other hand to increase it very quickly when the load on the boiler suddenly falls off. This is because changes in the rate of heat generation in the furnace always lag behind the changes in the rate of boiler demand, and by varying the rate of feed water supply inversely to the boiler demand for brief periods after sudden load changes, shortcomings on the part of the furnace in keeping up with rapid fluctuations are compensated for. Of course, where steady loads or slowly changing loads are in question, the rate of feed should always be in proportion to the load.

The Density of Oil

UNFORTUNATE it is that such a term as Beaume is used in connection with determining the density of an oil. It means very little to the average man. A "drummer" once came to me with his sample case full of small bottles of oil. He wanted me to buy his brand of oil. He took out one of his bottles, placed it on a table, put a hydrometer in it and exclaimed: "There! How's that?" I said, "How's what?" And thereupon he tried to explain to me that the little hydrometer floating in his oil proved beyond a shadow of doubt that his oil was a superior variety. I couldn't "see it," of course, and didn't buy, and since that incident I have learned that the gravity test doesn't amount to anything anyway.

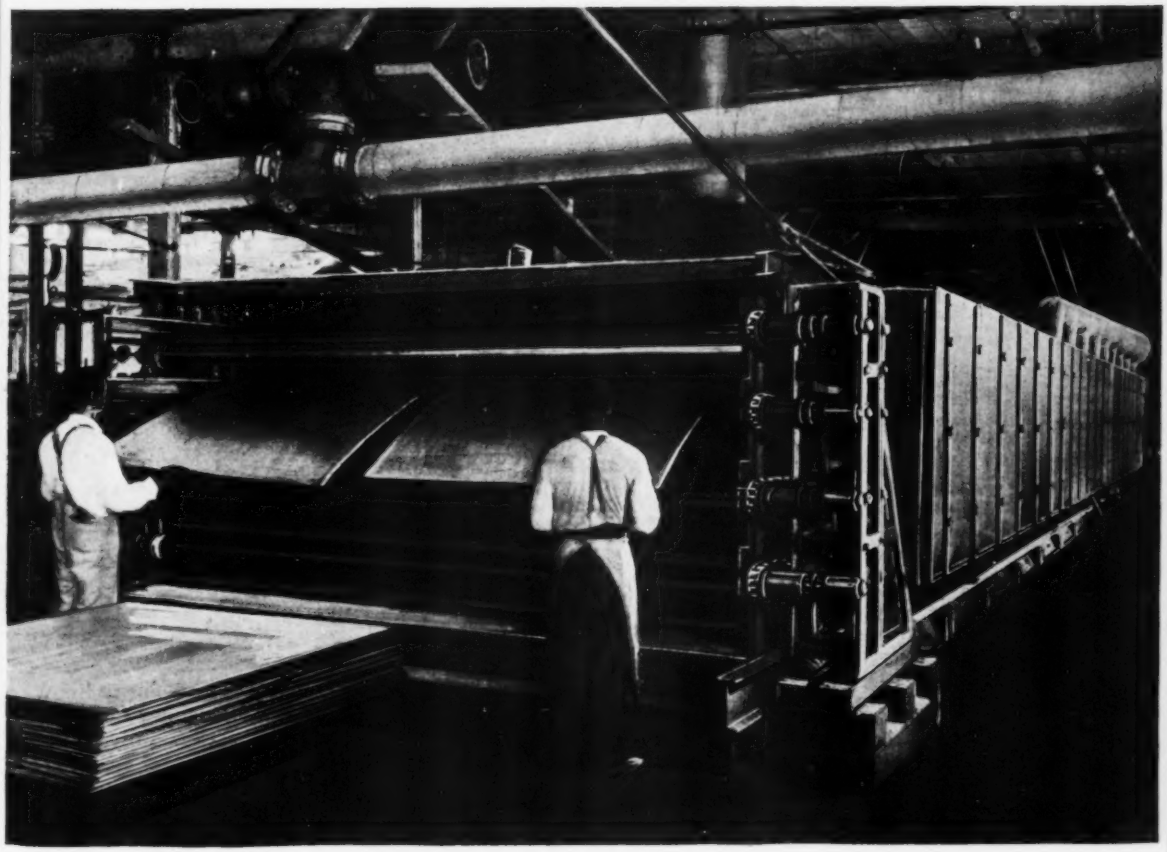
The hydrometer test is of value principally for "identifying" oils. For example, if you have been using a certain brand of oil for some time and you want to continue its use, just measure its density by means of a hydrometer and make note of it. Then the next time you buy oil that is claimed to be the same as the last you can at least easily check up its density. The density test is the easiest of all, especially if you have a hydrometer.

Pipe Bends

IN a recent meeting of the American Society of Mechanical Engineers, Sabin Crocker and Sterling S. Sanford pointed out that expansion and contraction in power plant piping should be given more careful consideration than it has been given. Up to the present time these gentlemen state that taking care of expansion and contraction has been too much a matter of judgment and that designers have not done sufficient calculating. Pipe bending problems have been looked upon as being very simple—in fact, too simple.

In the case of steam turbines with their gradually increasing capacity, pipe lines are constantly becoming larger and as a result the stresses due to expansion and contraction are becoming greater than ever. The forces set up by this expansion and contraction have become so great that accidents have actually occurred in which the piping has been torn away from anchorage that was assumed by its designers to be sufficiently strong.

When installing piping, therefore, be certain that the correct radius of curvature is used, that the pipes are sufficiently thick, that the joints are as strong as they should be, and that the anchorage is right.



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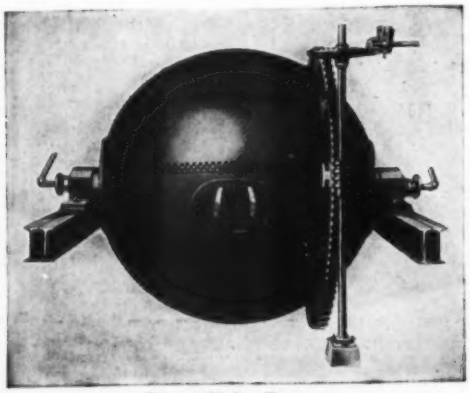

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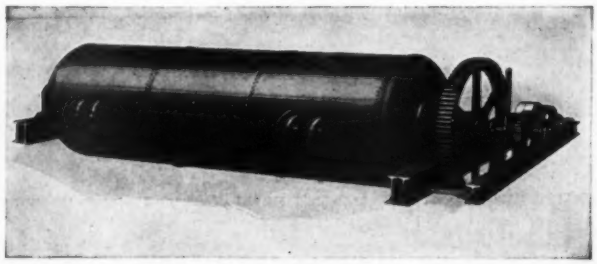


Biggs Cylinder Rotary

The Head-Box or Flow-Box

By HARRY WILLIAMSON

THE function of the headbox is to receive the dilute and screened stock from the collection troughs, and to deliver it on to the apron absolutely free from current or eddies, at the full width of the wire. As the box itself extends across the machine, naturally the stock flowing through onto the apron will be the same width. The box is usually built in position, and made of three of four inch hard pine plank, with water tight tongued and grooved joints. It is strengthened and stiffened by iron tie-rods, etc., wherever necessary. Its capacity, of course, is determined by the size and speed of the machine. A machine producing fifty tons of paper containing eight per cent of moisture will pass something like 4,700 tons of screened stock through the headbox in twenty-four hours.

The currents or eddies are overcome by dividing the box into communicating compartments by means of partitions, which are really baffle-plates. The box is usually divided into four compartments by means of three partitions. The stock enters the box from the collection troughs, flows under the first partition, over the second, (which is consequently, out of sight when the machine is running) under the third partition, and overflows the lip of the fourth compartment on to the apron in a placid body.

Provision is made for emptying the headbox quickly when shutting down the machine. The device most frequently met with consists of two holes about six inches in diameter cut in the bottom of the headbox in the end which is at the front or tending side of the machine. They are cut usually one in the second and one in the third compartment of the headbox. The holes are closed while the machine is running, by means of wooden plugs fixed to iron rods of sufficient length to reach to the top of the box.

There are other devices in use, various adaptations of slide valves, gate valves, etc., which are superior theoretically and mechanically, but the old plug in a hole is perfectly efficient and satisfactory.

Further Precaution Against Currents

Often, as a further precaution against currents, a perforated board is fixed in the last compartment of the headbox near the top. This may be fixed flat like the lid of a box, or obliquely as a "D" which is, perhaps, to be preferred, as it is easier to keep in place.

This perforated board is simply a plank about one or one and a half inches thick, drilled full of holes about $\frac{5}{8}$ inch in diameter. It is important that these holes be drilled smoothly and without ragged edges.

Whether there is any advantages in using this board is a matter of opinion. Undoubtedly, it will assist in breaking up currents, if any, also it will break up soft lumps (into pieces small enough to pass through the holes in the board) but it also gets coated with slime, the holes tend to fill with slime, and when partially filled it will retard the flow of stock enough to create considerable back pressure, and will then cause eddies in the stock, and give opportunity for lumps to form.

The two partitions which project above the surface of the stock are sprayed continuously with water from a revolving or oscillating showerpipe, to prevent stock from accumulating along the water-line. This shower also assists in keeping the stock free from foam and bubbles.

Some head-boxes are fitted with an overflow trough communicating with the mixing-box. This is fitted so that the bottom of the trough is just above the usual water level. Any sudden rush of stock into the head-box over and above the normal is taken care of by this trough and runs back into the mixing-box instead of flooding the wire. Such a rush might be caused by a flooded screen starting to function again, or by lowering a collection through the dam too quickly.

A Few Precautions

All corners in head boxes and troughs, both horizontal and vertical should be filled in with wood of triangular or spandrel section, so that no square corners exist.

The bottom of partitions one and three and the top of partition two should be half-round in section.

These last two things are precautions against slime-lumps.

Head boxes should be cleaned thoroughly whenever the screens are done.

A fresh water valve is usually provided at the front side of the head box, so that it may be filled quickly when starting the machine.

There is a space of about twelve inches between the last compartment of the head box, and the breast roll of the wire, which space is bridged over by a hinged board, known to paper-makers as the apron lip or apron board. It is not, strictly speaking, a part of the head box, but for convenience will be described here.

It serves the purpose of keeping the apron cloths flat and level where they are not supported by the wire. The bottom apron is usually secured to it by means of copper tacks. It is supported on the under side by brackets spaced about a foot apart along its length, which brackets are hinged in such a way that they fold back against the head box out of the way when putting on a wire. The board itself is hinged for the same reason. The forward edge of the board is bevelled from the under side to conform to the curve of the breast roll.

All Indications Point to a Successful Exposition

CONTRACTS for space at the Paper Industries Exposition to be held at the Grand Central Palace the week beginning April 9th are coming in daily, several taking two or more booths. The large number already secured assure, even at this early date, the complete success of the big paper show.

The interest taken outside of this country is shown by the fact that foreign paper manufacturers have secured space for the showing of their wares. In addition to the exhibits from Europe, it is of interest to note that an important Canadian paper manufacturer has this to say of the exposition:

"I congratulate you for having taken this up, and I am sure it will be a success. Let me know what the conditions are and in what form you would suggest our exhibiting."

Arrangements for the securing of reduced rates for those outside the city desiring to attend the exposition have been made through the American Paper and Pulp Association, which has secured reduced rates for its members to attend the conventions being held the week of the exposition. Those wishing to attend the exposition can secure reduced rates on the railroads, and be admitted without charge to the paper show by registering at the convention of the paper association.

The exposition management recently sent out 200 letters to associations of printers, publishers, stationers, bankers, food packers and other large users of paper, asking them to notify their memberships of the exposition and the opportunity extended to learn the whole story of the paper industry. Special arrangements are being made to arrange for the admittance of members of such organizations, and the advertising campaign to printers particularly is now running in the printing trades and other allied trade journals.

Meanwhile the proposed Printers and Publishers' Day, Friday, April 13th, has been enlarged to include the advertisers, with special attention to the big direct mail advertisers, who are such important users of all of the finer grades of paper. Several notable speakers have been invited to participate in the program on Friday afternoon.

Clean Food Day is being arranged, but the date has not been definitely set. It seems certain, however, that a special day will be set aside for the discussion of the use of paper and pulp containers to protect food from filth in its route to the consumer. Waxed paper on bread, vegetable parchment, glassine and greaseproof, and other special papers will come into this discussion, as well as boxes, cans and pails made of paper.

All of the printing schools in the neighborhood of New York are being invited to send their students to study the paper problem, so that they can become better printers, and vocational schools teaching subjects allied to the paper industry are included in this invitation, sent to such institutions as the College of the City of New York, the Columbia University's chemical engineering department and similar public and private institutions of learning.

There will be a still in full operation during the exposition. It is not, however, the kind of a still that you mean. It will be a still for the conversion of pine wood into chemicals used in the paper and other industries.

The latest exhibit scheduled for the Paper Industries Exposition is one showing the destructive distillation of pine, the production of resin, turpentine and other wood products, and it will be the display of the Paper Makers Chemical Company.

Educational Exhibits

Educational exhibits have been given space during the past week. The Bureau of Standards will show its work by the installation of beaters or some other miniature equipment, to be run during the exposition. The Forest Products Laboratory of Madison will have an exhibit, and it is possible that the Department of Commerce will have a booth to show the work being done by Secretary Hoover's department in the promotion of export trade in paper. If this booth is installed it will probably be in charge of John Matthews, Jr., chief of the paper division of the Bureau of Foreign and Domestic Commerce.

The New York State College of Forestry at Syracuse will have a booth devoted to the presentation of problems of reforestation and fire prevention in the pulp wood forests of the state.

Space is being taken by several of the leading paper companies for a presentation of their particular lines of paper. This applies to the manufacturers of standard grades of paper, as well as to such specialties as vegetable parchment, boxes and the like. One of the biggest companies manufacturing paper bags will have space, and a big wrapping paper company will be represented.

"The preliminary campaign is rapidly shaping itself, so that we shall soon be able to know just how extensive the Paper Industries Exposition will be," said Charles F. Roth, one of the managers of the exposition. "We are well ahead of what we considered a good record in the early period of the Chemical Exposition, in the way of sales of exhibit space.

"We can say this early in the work for the exposition, that the exhibits will be so widely diversified as to make the show a complete picture of the industry—from the raw materials through to the consumer. It will not be a paper-making supplies exposition, neither will it be a show of paper only, but it will be a graphic portrayal through widely diversified ex-

hibits of the whole range, from raw materials supply men, through the manufacturing processes, to the merchandising phase of the industry, and particularly of the use of paper by converters for bags, envelopes and specialties."

List of Exhibitors

Here is a list of exhibitors who will be at the Paper Industries Exposition. This list is dated February 27th.

American Writing Paper Co., Holyoke, Mass.
American Manufacturing Co., Noble and West Sts., Brooklyn, N. Y.
Angel, H. Reeve, Co., Inc., 7 Spruce St., New York City.
Archer, A. W., Co., Inc., 325 Broadway, New York City.
Albany Felt Co., Albany, N. Y.
Appleton Woolen Co., Appleton, Wis.
American Paper Merchant, 27 Warren St., New York City.
Bagley & Sewall Co., Watertown, N. Y.
Bauer, Richard, 476 Broome St., New York City.
Bird Machine Co., South Walpole, Mass.
Booth Chemical Company, Elizabeth, N. J.
Cameron Machine Co., 61 Poplar St., Brooklyn, N. Y.
Cayuga Linen & Cotton Mills, Inc., Auburn, N. Y.
Canadian Ingersoll-Rand Co., Montreal, Canada.
Cooper & Cooper, Inc., 23 Cliff St., New York City.
Carthage Machine Co., Carthage, N. Y.
Dorr Co., 101 Park Ave., New York City.
Duriron Company, Inc., Dayton, O.
Draper Bros., Canton, Mass.
Electro Bleaching Gas Co., 18 East 41st St., New York City.
Flintkote Co., Boston, Mass.
Foreign Paper Mills, 72 Duane St., New York City.
Frederick Iron & Steel Co., Frederick, Md.
Hardy, Wm. A., & Sons Co., Fitchburg, Mass.
Huyck, F. C., & Sons, Albany, N. Y.
Hercules Powder Co., Wilmington, Del.
Individual Drinking Cup Co., Easton, Pa.
Jeffrey Manufacturing Co., Columbus, O.
Jenssen, G. D., Co., 200 Fifth Ave., New York City.
Keystone Lubricating Co., Philadelphia, Pa.
Knox Woolen Co., Camden, Me.
Lewis, J. P., Company, Beaver Falls, N. Y.
Lockwood Trade Journal Co., 19 E. 39th St., New York City.
Lockport Felt Co., Newfane, N. Y.

Mathieson Alkali Works, 25 West 43rd St., New York City.
Nash Engineering Co., South Norwalk, Conn.
National City Paper Corp., 72 Duane St., New York City.
N. Y. State College of Forestry, Syracuse, N. Y.
New York Gummed Paper Company, 25 Dey St., New York City.
Oliver Continuous Filter Co., 33 West 42nd St., New York City.
Paper Makers Chemical Co., Holyoke, Mass.
Paper Makers Felt Industries, Albany, N. Y.
Pequot Manufacturing Corp., Manley St., Thompson and Nelson Aves., Long Island City, N. Y.
Purity Paper Vessels Co., 5-11 West Conway St., Baltimore, Md.
Paper Industry, 53 W. Jackson Blvd., Chicago
Paper Mill and Wood Pulp News, 154 Nassau St., New York City.
Paper Trade Journal, 10 E. 39th St., New York City.
Paper Machine Wire Manufacturers Council, Belleville, N. J.
Paper Makers Importing Co., Easton, Pa.
Ross, J. O., Engr. Corp., 30 E. 42nd St., New York City.
SKF Industries, Inc., 165 Broadway, New York City.
Sandusky Foundry & Mch. Co., Sandusky, O.
Sealright Co., Inc., Fulton, N. Y.
Shuler & Benninghofen, Hamilton, O.
Talcott, W. O. & M. W., Inc., 91 Sabin St., Providence, R. I.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.
Union Bag & Paper Corp., Woolworth Bldg., New York City.
Union Sulphur Company, 33 Rector St., New York City.
U. S. Bureau of Standards, Washington, D. C.
U. S. Bureau Foreign and Domestic Commerce, Washington, D. C.
U. S. Forest Service, Washington, D. C.
Voorhees Rubber Co., 20 Bostwick Ave., Jersey City, N. J.
Westfield River Paper Co., Russell, Mass. N. Y. Office, 350 Madison Ave.
Wallace, Jos. H., & Co., 5 Beekman St., New York City.
Waterbury Felt Co., Skaneateles, N. Y.
Western Paper Makers Chemical Co., Holyoke, Mass.
Williams, C. K., & Co., Easton, Pa.

Second Meeting of Superintendents Board Division

The board division of the American Pulp and Paper Mill Superintendents' Association held their second meeting at the Congress Hotel, Chicago, on February 10.

Immediately following the luncheon at noon the few matters of business pertaining to the association were discussed. Among other things was the question of dates for future meetings. The consensus of opinions seemed to be in favor of four meetings. The next meeting will therefore be held on the second Saturday in May—May 12.

The secretary, Daniel Gallery had arranged an exceptionally meaty program for the afternoon. As this program progressed, one was almost reminded of a well organized post-graduate class in certain phases of paper making. It is, we feel, the height of conservation to state that every mill man in the bunch went back to his mill a better paper maker and more fitted to make paper at a profit for his company.

W. S. Rooney of the Albany Felt Company, during the afternoon, gave an illustrated talk on "The Manufacture of Felts." In his introductory remarks, Mr. Rooney made it very clear that a paper maker's felt was altogether a "tailor-made" proposition. The felt must be made for the machine. The best results could always be obtained when the paper maker and felt manufacturer were co-operating to produce felts that would fit the machine.

Mr. Rooney illustrated with lantern slides the score and more operations which are involved in the manufacture of a well made paper mill felt. Every step, together with the sheep feeding on the hillside to the felts completed and packed for shipment was clearly pictured and interestingly explained.

Following his talk on the manufacturer of felts, Mr. Rooney gave a very interesting account of his experiences in Japan. This talk was also illustrated with photographs taken by the speaker.

W. F. Ebbing of The Ohio Knife Company was next on the program and gave a brief but very much to the point paper on fly bars. Mr. Ebbing's paper will be found elsewhere in this issue.

Mr. Hebbard of the Automatic Fuel Saving Company, Cincinnati, gave a few remarks on the subject of combustion control, following which was a general discussion of the subject in which many of the attending superintendents took part. Mr. Hebbard is at this time installing one of their Gray Systems of Combustion Control on one of the boilers at The Chicago Mill and Lumber Company. It is estimated that this system will effect a very decided saving in fuel consumption.

If the afternoon session reminded one of the class room, the banquet in the evening reminded one of students just released from the discipline of the class room. There was no formal program arranged for this evening affair and there was certainly none followed. Chairman Nicely had arranged for the entertainment—etc. At the close of the meeting all were very apparently in good spirits.

List of Those in Attendance

Lee L. Wilson, Morris Paper Mills, Morris, Ill.; J. A. Reitzel, Morris Paper Mills, Morris, Ill.; James P. Furlong, Ruberoid Co., Joliet, Ill.; W. C. Smith, Dayton Knife Co., Dayton, O.; W. F. Ebbing, Ohio Knife Co, Cincinnati, O.; Henry Burt, Milwaukee, Wis.; Louis A. Guernier, Shears, Chicago; G. W. Whitcomb, Paper Mill, Chicago; O. W. Middleton, Boxboard, Chicago; Oliver Buswell, The Paper Industry, Chicago; J. N. Harbrecht, Hinde & Dauch Paper Co., Sandusky, O.; J. R. Carter, J. G. Cherry Co., Tama, Ia.; H. K. Mathers, J. G. Cherry Co., Tama, Ia.; J. L. Burt, Consolidated Paper Co., Monroe, Mich.; Claude E. Nicely, La Salle Paper Co., South Bend, Ind.; Bernard Benson, Williams-Gray Co., Chicago; W. A. Yule, F. C. Huyck & Sons, Albany, N. Y.; Charles Raney, Midwest Box Co., Chicago; R. F. Knott, Crescent Paper Co., Marsailles, Ill.; F. E. Kerr, American Strawboard Co., Noblesville, Ind.; T. L. Peterson, Mt. Vernon Strawboard Co.; T. C. Hamill, Albany Felt Co., Albany, N. Y.; Daniel Gallery, Chicago Mill Lumber Co, Chicago; W. S. Rooney, Albany Felt Co., Albany, N. Y.

The Determination of the Effect of Pressure on the Strength of Test-Sheets in the Strength-Testing of Pulp*

By E. P. CAMERON, B.Sc.

Chief of Division of Pulp and Paper Forest Products Laboratories of Canada (Dominion Forestry Branch), Montreal

IN THE testing of a pulp for strength, test-sheets are formed from a prepared slush of the pulp, either by means of a hand-mold or by some form of constant-weight sheet-machine. The sheets thus formed are couched off with felts, pressed, dried and tested.

In a critical study of the details of this procedure it is found that no operation in it has more effect on the ultimate strength of the test-sheet than that of pressing. We have but to compare the strengths of pressed and unpressed sheets of identical composition and formation to amply demonstrate this.

The effect of variables entering into the other steps of the procedure have been more or less thoroughly investigated but a search has been made in vain for any published data on the effect of varying the pressure. Its importance lies not only in the fact that a standard method for testing the strength of a pulp should develop its maximum possible strength, but more particularly in the elimination of the personal error in carrying out the tests. At the present time all mills which carry out strength-tests on their pulps are using some form of hand-screw press. In some cases these presses are of light construction and the pressures obtained are correspondingly low. In other mills heavily constructed presses are used and are screwed home by means of a stout bar inserted through the handle. Obviously, if pressure has any effect on the strength, these two methods will yield entirely different results with the same pulp.

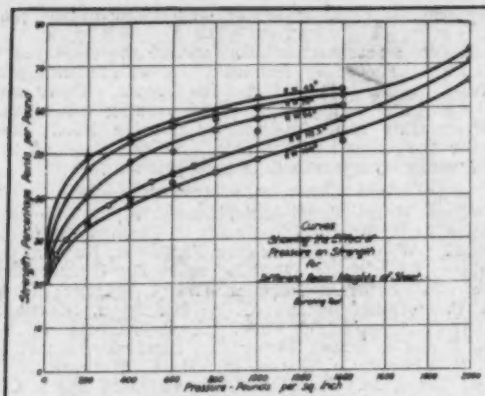
In the ordinary method of pressing, it is safe to assume that the pressure actually applied to the sheet does not exceed fifteen pounds per square inch. The increase in strength due to this pressure is amply demonstrated by the following results.

	Strength per cent
Unpressed	14.8
Pressed in small screw letter-press	26.7

These results each represent the average of ten sheets, five bursting-tests being taken per sheet. The sheets were nearly identical in composition and formation as it is possible to obtain so that the results are directly comparable.

From these results it is seen that the increase in strength developed by this simple means is approximately one hundred per cent. The question that naturally arises is—Will this increase in strength continue in the same ratio for corresponding increases in the pressure applied? If this is so, or even only approximately so, the different methods of pressing previously referred to will yield entirely different results with

*Paper read before the Technical Section of the Canadian Pulp and Paper Association held at Montreal, January 24 and 25, 1923.



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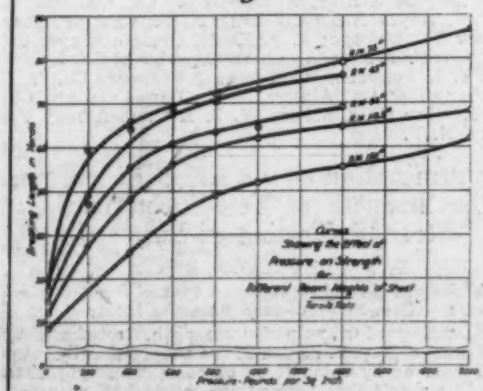

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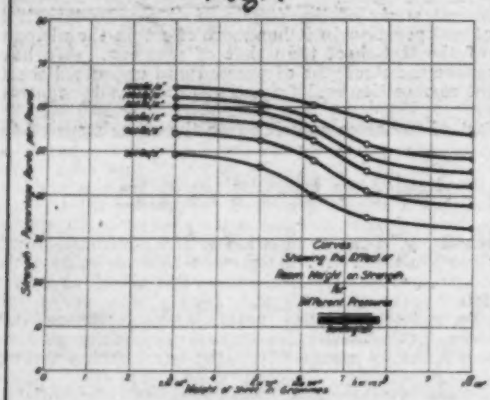

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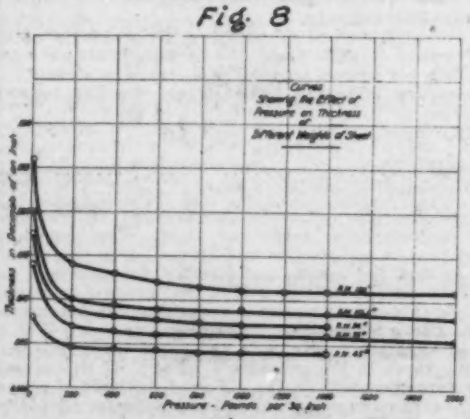

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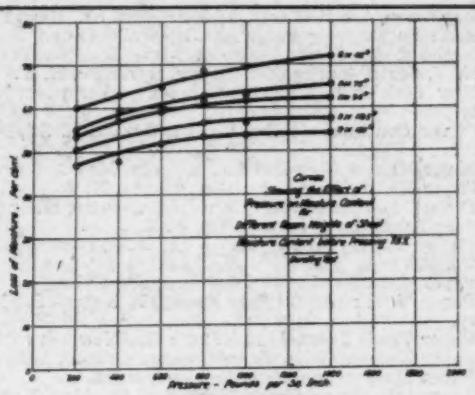

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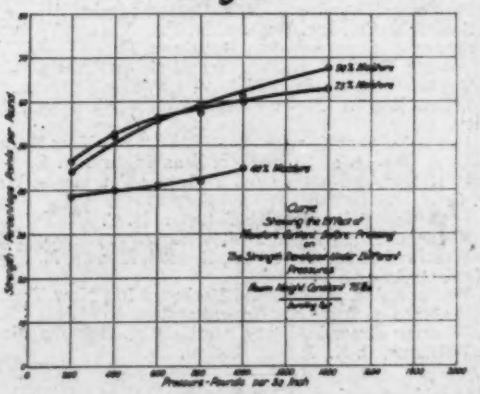

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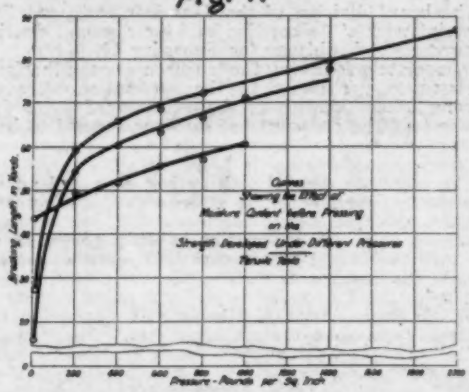

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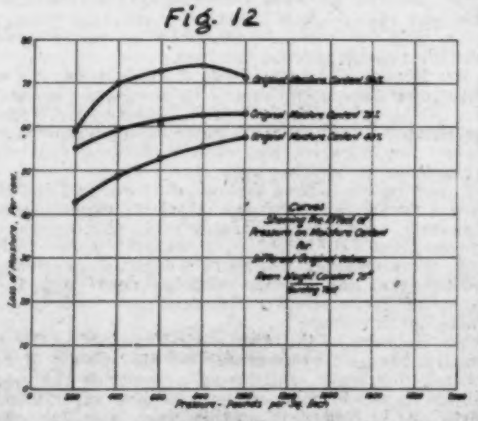

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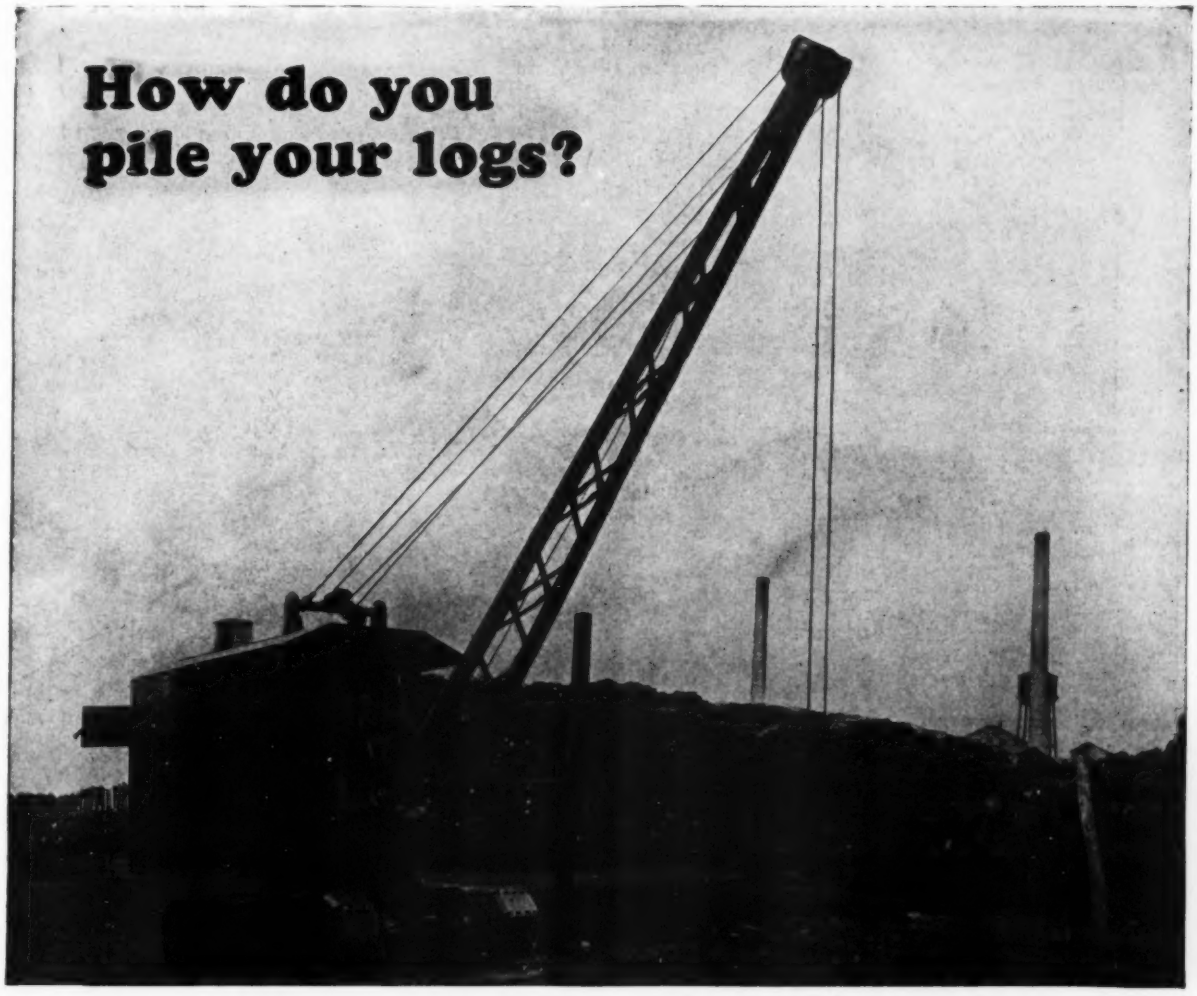

Let this McMYLER-INTERSTATE Crawler Crane do the job!

Here's a mobile crane of 10 tons capacity that will unload your logs from the cars, pile them in orderly storage rows and deliver them from storage to the mill.

With its broad crawler treads, it travels without hesitating over railroad tracks, through sand and mud, up steep grades and down. And it will carry its load with it, too.

Besides handling your logs this No. 2 McMyler-Interstate Crawler Crane will unload coal or do your excavating and assist in construction work.

Construction that is sturdy and generous in every detail makes this crane one that will stand up under hard work, day in and day out, permitting its operator to give his full time to production.

May we tell you more fully why you need this crane in your plant?

Locomotive Cranes · Car Dumpers · Coal and Ore Handling Machinery · Forgings
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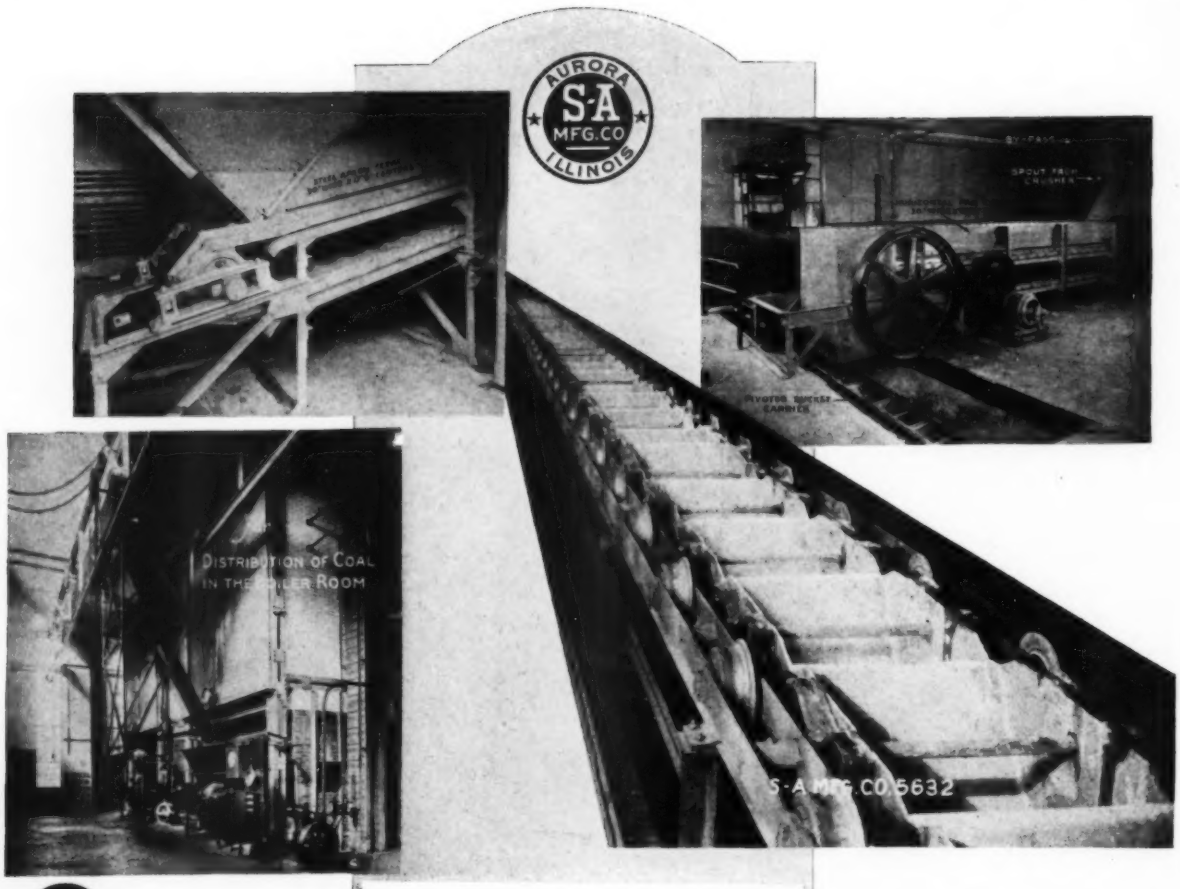

?What is the Power Plant Cost●

One of the important items of expense is the cost of handling coal and ashes.

Answer these questions to your own satisfaction, taking your own power plant for example.

1st—Are you ever required to pay demurrage on coal cars for the lack of adequate handling capacity?
2nd—Are you paying for stoker size coal when with a crusher you could be independent and crush and size coal at your plant?
3rd—Is the plant equipped with such machinery that coal is transferred from the railroad cars to the stokers with practically no hand labor?
4th—Is there adequate storage for surplus supplies of coal to meet an emergency shortage?

S-A Power Plant Coal and Ash Handling Machinery is installed in many of the big Paper Mills. *Write for Catalog 22-P*

Stephens-Adamson Mfg. Co.
Aurora **Illinois**

the same pulp, and the necessity of a standardized method of pressing is made apparent.

It was in an attempt to obtain data on this problem that the following series of tests were undertaken. The pressures applied have been carried to great extremes purely from the point of view of scientific interest and not with any idea that such pressures should be incorporated in any standard method of testing for routine mill-work. The lower pressures used however are well within those easily obtained by inexpensive means in any mill.

Variables in the sheet itself such as formation, basis weight and moisture content would undoubtedly affect the results of the test so that these were investigated at the same time.

Apparatus and Manipulation

The stock used for these tests was unbleached sulphite pulp received at the Laboratories in the form of machine-dried

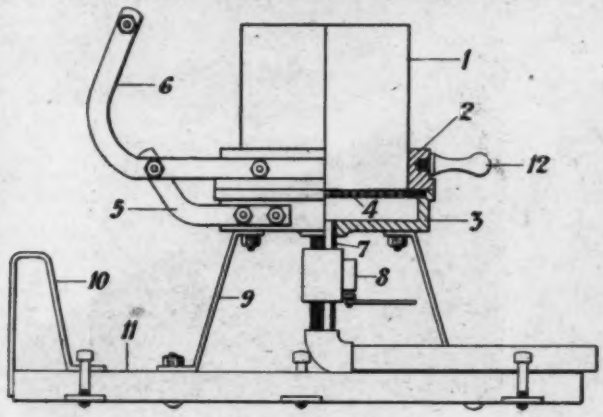

Fig. 1—Sheet machine (diagram)

sheets. In the preliminary preparation of this stock there were two alternative methods to consider, namely:

The preparation of separate batches of stock for each day's tests, or the preparation of sufficient stock at the start to insure an ample supply for all the tests desired.

The first method had the following objections: Probable variations in the amount of hydration obtained in the disintegration of each batch of stock, increased work necessary to bring the stock to the same consistency each time, and possible variations in the pulp itself.

The latter method eliminates all of the above objections, but is open to that of the probable increase in hydration due to standing in the slush state throughout the whole time of the experiments. This latter method was adopted from strength tests carried out on the stock at the beginning and at the end of the work the effect of standing in the slush state for this period of time was found to be negligible. As the results of this test may prove of interest they are set forth in the following table:

Particulars of Sample	Percent Strength Mullen Test	Tensile Strength Breaking Length Yards
Sample taken Dec. 7, 1922.....	26.7	27.30
Sample taken Jan. 3, 1923.....	29.1	27.28

The sheet pulp was disintegrated in the small 40-pound beater of the Laboratories for fifteen minutes with the steel roll well raised. This treatment was carried out purely as a means of opening out the stock, any actual beating action being avoided, as it was desired to carry out the tests on unbeaten stock. Whatever hydration was caused by this treatment was so very slight as to be negligible and was constant for all samples taken. After this treatment the slush stock was transferred to a small chest where it was kept throughout the duration of the tests.

Procedure in Forming the Test-Sheets

The stock in the chest was thoroughly stirred previous to the taking of the sample, and its consistency determined from time to time throughout the whole series of tests to check any variation. The sample taken from the chest was just sufficient to form the number of sheets required at that particular time. This sample was then diluted to 0.5 per cent consistency for ease in measuring the required amount for the constant-weight sheets. After dilution the requisite amount of the stock was weighed in a tared beaker on a large chemical balance and then diluted to approximately five litres in a fibreware pail.

The apparatus used for forming the test-sheets was a Sheet Machine made, with a few minor alterations, from the patterns of K. G. Wilen (Wayagamack Pulp and Paper Company) and described by him in the Pulp and Paper Magazine of Canada, January 20th, 1921. It consists essentially of two brass castings (Fig. 1, numbers 1, 2 and 3) the adjoining faces of which are machined to a watertight fit. To the interior of the top casting is soldered a sheet brass box, the interior dimensions of which are 8 ins. x 8 ins. with both top and bottom open, the whole forming the dockle-box of the apparatus. The lower casting is fitted with a water outlet (7) to which is connected a Quick-opening gate valve (8) and discharge pipe. The interior of the lower casting is slotted to take the screen plate (4) which is made of a quarter-inch accurately planed brass plate with quarter-inch holes drilled and countersunk at half-inch centres. This plate is covered, first by a 14-mesh wire screen and then by a 60-mesh screen, soldered and sewed on so that it lies perfectly flat. The screen plate in this apparatus is easily removable for cleaning and repair, this being an advantage over the original design in which the screen plate was soldered directly to the casting. The deckle-box is fitted with a lever bar (6) which is hinged to the fulcrum bar (5) of the chamber box casting, thus providing an easy means for removing the deckle-box in order to couch the sheet off the wire. The stop (10) holds the deckle-box in the open position and the handle (12) is used to swing the deckle-box open. The total suction head is eight inches (top of screen to centre of discharge pipe) which is ample to form sheets from all but very "slow" stocks.

The complete installation is shown in Fig. 2. The operation of the machine is as follows:

The diluted stock in the fibreware pail is poured into the deckle-box of the apparatus, care being taken that the discharge and valve is opened and drainage commenced. During drainage the surfaces of the two castings should be watertight. The sheet having been formed on the wire, the deckle-box is thrown back and the sheet couched off on a napless felt using a large wooden rocker as the couching medium. The felt with the adhering sheet is then placed on a brass plate ready for pressing, and the next sheet formed on the machine. In this way the machine produces sheets of constant weight and of very excellent formation.

It was very important that the sheets should contain a constant percentage of moisture at the time of pressing and this was conveniently accomplished in the following way. It was known from previous work that if the felts used for couching had been thoroughly saturated with water and pressed in the letter-press before the sheet was couched on them and that the sheets and felts had then been pressed together in the press for two minutes, that the moisture-content of the sheets would be practically constant at 75 per cent. no matter what

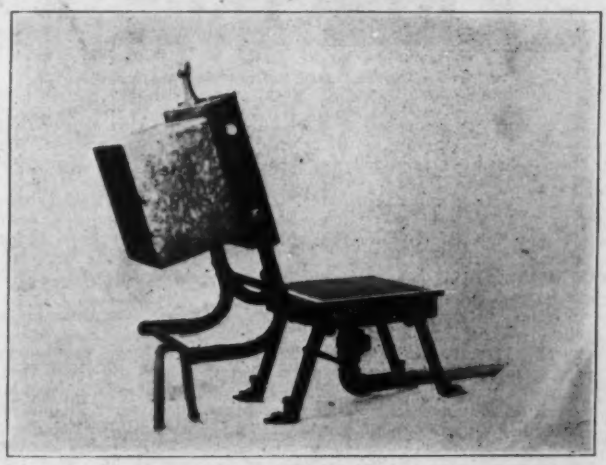

Fig. 2—Sheet machine (installation)

their basis-weight might have been. This, then, was a means of obtaining a constant moisture-content for the sheet, and it was found that if the sheets were left between the felts and if both were wrapped in a damp towel, that this moisture-content would remain constant over considerable periods of time. This was determined from the following test.

A stack of eighteen sheets was made and pressed as described above. Sample sheets were taken throughout the pile at different time intervals and their moisture content determined. The results obtained are given as follows:

Retention of Moisture in Test Sheets

Sheet No.	0 Hrs.	Sheet No.	3 Hrs.	Sheet No.	4 Hrs.	Sheet No.	24 Hrs.
1	76.2	4	76.7	6	77.1	5	77.4
8	76.9	12	77.8	15	77.7	14	76.9
11	73.5					16	76.6
18	76.4					17	76.6
Average	75.75		77.25		77.4		76.87

From these results it is seen that the moisture-content of the sheets can be kept constant over considerable time-intervals by this means. A study of the tables of results of the tests shows how constant this moisture-content remained throughout the whole series.

In those tests which required moisture-content above or below 75 per cent. the procedure had to be altered. In the case of the 90 per cent. sheets referred to later, they were not pressed at all. The sheet was couched from the wire on a blotting paper laid over the usual felt, and felts, blotting papers and sheets were stacked together and allowed to remain until wanted.

Where a 40 per cent moisture-content was desired in the sheets they received a double pressing. The first pressing was as usual, except that it was only for one minute, after which time the sheets were replaced between dry blotters and given an additional one minute's pressing. They were then allowed to remain between the damp blotters until used.

In order to obtain a definite pressure per square inch on the sheets when pressed in the tests, it was necessary that the pressure should be applied over a definite area of sheet each time and in such a way that the total pressure on the machine would act uniformly over the whole area of the sheet under test. To this end a cast iron block was made 6 in. x 7 in. x ¾

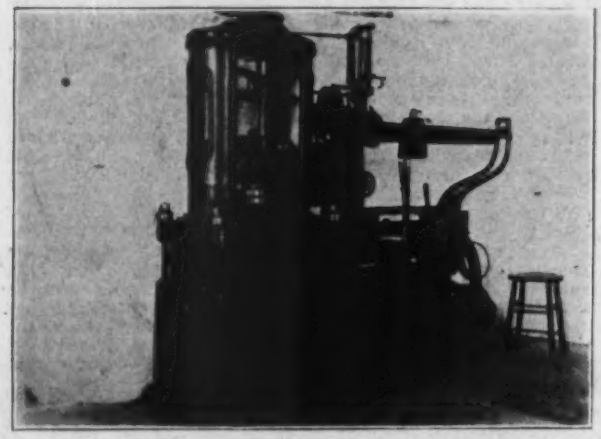

Fig. 3—Machine used for applying pressures

in. accurately smoothed on each surface. This size was chosen as most convenient both from the point of view of the total pressures required and from the size of the sheet for test purposes. In order to bring the sheet accurately to this size they were cut on a trimming board. Each sheet cut was backed by a sheet of cheap letter paper so that a clean cut edge would be obtained. In the case of those sheets containing 90 per cent moisture, the sheets together with its blotter was cut in this way, as it was impossible to handle it in any other way.

After cutting, the sheets were accurately weighed on a chemical balance fitted with a specially constructed scale-pan. After weighing the sheet, four blotters, previously cut to size, were placed on each side of it and the stack thus formed placed on the lower testing block of a special machine. The accurately-sized cast-iron block was then placed carefully on the top of the stack and a ball-and-socket plate was placed above this to insure the pressure being evenly distributed over the whole area of the test-sheet. The set-up thus formed was centered under the pressure-head of the machine and the pressure applied.

The press used for these tests was a 60,000-pound Riehle Testing Machine in the Strength of Materials Laboratory of McGill University. A description of the mechanics and operation of this machine will not be attempted here; it is sufficient to say that the pressures applied would be very accurately controlled.

Fig. 3 gives a very good idea of the machine and shows a completed set-up ready for pressing. The duration of the pressure was four minutes in all tests and the rate of loading constant at .0.024 ft. per minute.

After being pressed the sheets were reweighed and placed on the drying-rack to attain air-dryness.

Twelve hours were allowed for the sheets to come to air-dryness after which they were again reweighed. From these three weighings, the moisture content before pressing, the loss in moisture during pressing and the ream weight were

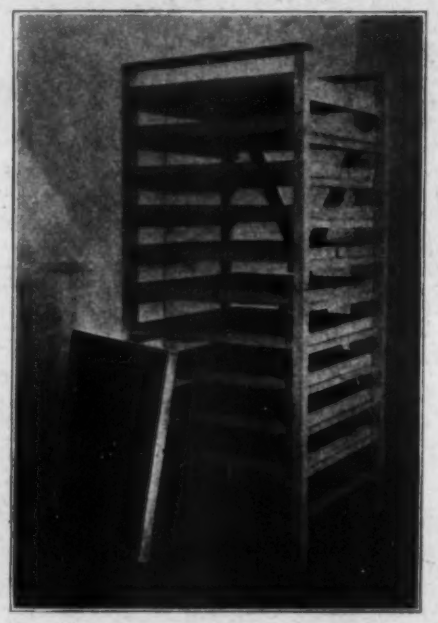

Fig. 4—Drying rack for test-sheets

calculated. After the final weighing the sheets were placed in a humidifier where they were allowed to come to a constant moisture-content before they were tested.

This humidifier consisted of a large dessicator in the bottom portion of which was placed a 43.5 per cent. solution of Sulphuric acid. This solution gives a constant relative humidity of 50 per cent. at 25° C. (v. The control of Humidities by Means of Sulphuric Acid Solutions. Jour. Ind. Eng. Chem. 1921 p. 326).

The sheets were allowed to remain in this apparatus for three hours after which they were immediately tested.

This arrangement was designed to eliminate the effect of varying humidities on the strength-tests, and although

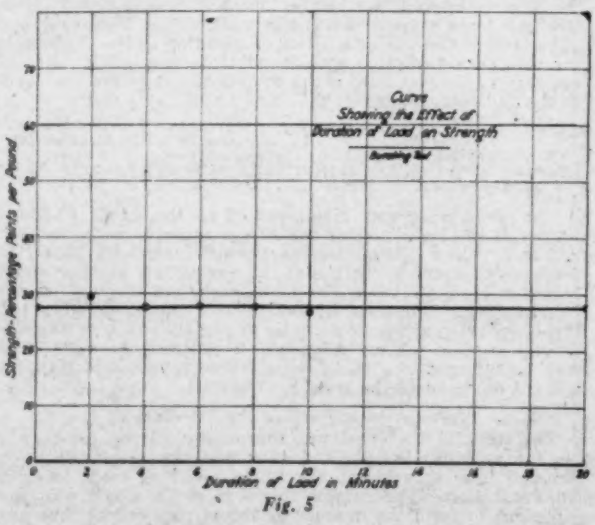

Fig. 5

it is not perfect, yet confidence may be felt that its results were not affected to any great extent by this variable.

Before being placed in the humidity apparatus a strip was ruled diagonally across the sheet to allow of two tensile tests being taken.

Five bursting tests were taken on the remaining portions of the sheet, a Mullen Tester being used. The untouched centre strips were then cut out and replaced in another similar humidifier and at the expiration of three hours the strips were used for the determination of the tensile strength. A Schopper Tensile Tester was used for this purpose.

In the earlier portions of the work ten test-sheets were used per point on the curves developed. This gave an average of fifty bursting tests per point on the curve of bursting strengths, and twenty tensile tests per point on the curve of tensile strength. The variation in the different sheets was found to be so small however that this number was cut down to five. Thus in the great majority of the curves each point represents an average of twenty-five bursting tests and ten tensile tests for their respective curves.

The Mullen Tester was accurately standardized against a Crosby Pressure-Gauge Tester previous to the commencement of the work and from time to time throughout the series. The concentration of the acid in the humidifiers was also checked from time to time but very little variation was noticed.

Details of Tests and Results

Test 1. The Determination of the Effect of the Duration of the Load on the Strength.

For this determination a heavy basic-weight of sheet was chosen and a low pressure used on the machine. This was done chiefly from the point of view of ease in manipulation, the heavy weight of sheet largely eliminating the small variations in the formation of the sheets and the low pressures being quickly obtained on the machine.

TABLE I

Test No. 1

Constants:
Rate of Loading—0.024 ft. per min.
Basis Weight of Sheet—150 lb.
Load—100 lb. per sq. in.
Moisture before Pressing—75 p. c.

Variables:
Duration of Load

Duration of Load Minutes	Ream Weight	Bursting Strength Per Cent
0	150.42	27.42
2	152.41	29.6
4	150.62	27.52
6	150.86	27.08
8	150.74	27.44
10	149.69	26.75
20	150.97	27.13

It was seen from these results that the duration of the load had no appreciable effect on the strength so that any convenient time could be chosen as the standard. The zero time on the above table represents the load applied and immediately removed. It must not be overlooked, however, that this represents some minutes due to the time taken by the machine in applying and removing the load. The other times given represent the lengths of time during which the loads were held constant. Four minutes were chosen as the standard time during which all loads should be held constant throughout the tests. The results of this test are shown graphically in Figure V.

Test No. 2.

The Determination of the Effect of Pressure on Strength:

This test was carried out on five different basis-weights of sheet, namely, 45 lb., 75 lb., 94 lb., 112.5 lb., and 150 lb. When working with the 112.5 lb., sheets (the first series carried out), the pressures were increased in increments of 100 pounds per square inch. In the lower pressures increments of 50 pounds per square inch were used. In the other series, however, increments of 200 pounds per square inch were used, as it was only necessary to establish the manner in which these latter curves varied from that of the first series. It was thought that there would be two limiting values to the weights of sheet used, the upper limit being dependent upon the effect of the pressure on the strength, and the lower limit depending upon the formation of the sheet. The results of each series in this test are tabulated separately below and the curves thus established are shown in Figures 6 to 10.

TABLE II

Test No. 2—The Determination of the Effect of the Pressure Applied on the Strength

Constants:
Rate of Loading—0.024 ft. per min.
Duration of Load—4 mins.
Moisture before Pressing—75 p. c.

Variables:
Basis-Weight
Pressure Applied

Series (a) Basis-Weight 45 lbs.

Pressure Applied lb. per sq. in.	Moisture before Pressing p. c.	Moisture after Pressing p. c.	Moisture extracted p. c.	Basis Weight	Thickness	Bursting Strength % points per lb.	Tensile Strength Breaking Length yds.
0	76.0	....	....	43	.008	28.2	30.04
200	74.6	29.6	60.3	45	.0046	49.2	47.00
400	76.8	28.6	62.7	47	.0045	53.9	64.16
600	75.7	26.7	64.8	46	.0044	57.3	67.5
800	77.0	23.8	68.5	44	.004	59.1	70.2
1000	78.1	24.1	69.2	44	.004	62.5	73.2
1400	77.8	22.0	71.7	44.5	.004	64.5	76.6

Pressure Applied lb. per sq. in.	Moisture before Pressing p. c.	Moisture after Pressing p. c.	Moisture extracted p. c.	Basis Weight	Thickness	Bursting Strength % points per lb.	Tensile Strength Breaking Length yds.
Series (b) Basis-Weight 75 lbs.							
0	....	....	....	74.5	.014	26.7	27.30
0	....	....	....	74.5	.014	29.1	27.28
200	74.2	33.4	55.9	74.5	.007	46.5	59.25
400	76.6	31.3	59.2	72.0	.0065	52.7	65.95
600	74.7	29.6	60.4	73.5	.0063	56.5	68.5
800	75.6	28.2	62.7	74.5	.0062	57.6	72.05
1000	78.8	29.5	62.8	74.0	.006	60.0	62.9
1400	75.8	26.4	65.2	77.5	.006	63.1	79.6
2000	....	....	....	74.0	.0055	73.4	86.9
Series (c) Basis-Weight 94 lbs.							
0	76.3	....	....	93.0	.0175	23.9	24.76
200	74.7	34.8	53.45	95.5	.009	46.2	49.0
400	75.2	32.3	57.1	94.0	.0082	48.2	55.35
600	76.2	31.2	59.1	94.0	.0078	50.2	60.7
800	74.5	28.4	61.9	95.0	.0075	55.2	63.2
1000	75.4	28.8	61.8	94.0	.0072	57.7	64.25
1400	75.7	28.7	62.1	94.0	.0072	60.6	69.4
Series (c) Basis-Weight 150 lbs.							
0	75.7	....	....	147	.026	20.2	18.62
200	75.45	39.92	47.05	148	.014	33.7	32.77
400	76.0	39.6	47.9	148	.013	38.2	36.00
600	75.6	36.5	51.7	147.5	.012	43.2	44.30
800	75.9	35.5	53.2	148	.0115	45.6	49.15
1000	75.1	34.8	53.7	149	.011	48.4	51.95
1400	76.2	35.0	54.1	150	.011	52.4	55.5
2000	....	....	....	148	.01	66.2	62.3

The results of these tests are shown in graphical from in the following figures:

Fig. 6—Curves Showing the Effect of Pressure on Strength for different Ream-Weights of Sheet (Bursting Tests).

Fig. 7—Curves Showing the Effect of Pressure on Strength for different Ream-Weights of Sheet (Tensile Tests).

Fig. 8—Curves Showing the Effect of Ream-Weight on Strength for Different Pressure (Bursting Tests).

Fig. 9—Curves Showing the Effect of Pressure on Thickness of Different Weights of Sheet.

Fig. 10—Curves Showing thee Effect of Pressure on Moisture-Content for Different Ream-Weights of Sheet.

In studying these results it is seen that increasing the pressure applied increases the strength of the test-sheet (Figs. 6 and 7). This increase in strength is most marked at the lower pressures and on the lighter weights of sheet. It falls off with increased pressures and heavier basis-weights of sheet. This increase is still noticeable at very high pressures, the maximum pressures used in these tests (one ton per square inch) still showing this condition plainly.

The decrease in strength as the ream weight is increased, for any constant pressure used, is shown very clearly in Fig. 8. The effect of this variable seems to be practically constant for all the pressures used in these tests.

The effect of the pressure on the thickness of the sheet is much what would be expected (Fig. IX) and seems to be constant for all the different weights of sheet used.

The loss of moisture due to the pressing (Fig. X) varies inversely with the basis-weight of the sheet. This effect, however, is constant for any given pressure applied.

Two points of particular value are shown in these results. Uniform pressures must be applied to the test-sheets if uniform results are to be obtained from the tests and light-weight test-sheets must be used if maximum strength figures are desired. The best weight of test-sheet to be used, both from the point of view of case and reliability in formation, and suitability for testing purposes, is the 75 pound sheet.

It seems probable that the moisture-content of the sheet at the time of pressing would have a decided effect on the results obtained, so that in order to establish this point Test No. 3 was carried out.

Test No. 3.

The determination of the Effect of the Moisture-Content Before Pressing on the Strength Developed under Different Pressures:

Test sheets of basis-weight of 75 pounds were used in this test. The effect of variations in pressures over the same range as previously used was determined on test-sheets containing moisture-contents of 90 per cent., 75 per cent., and 40 per cent., previous to being pressed.

The results of these three series are given in Table III.

TABLE III

Test No. 3—The Determination of the Effect of the Moisture Content Before Pressing on the Strength Developed Under Different Pressures

Constants:
Rate of Loading—0.024 ft. per min.
Duration of Load—4 min.
Basis-Weight—75 lbs.

Variables:
Moisture-Content before Pressing
Pressure Applied

Series (a) Moisture before Pressing 90 p. c.

Pressure Applied lb. per sq. in.	Moisture before Pressing p. c.	Moisture after Pressing p. c.	Moisture extracted p. c.	Basis Weight	Thickness	Bursting Strength % points per lb.	Tensile Strength Breaking Length yds.
0	....	....	....	74	.02	14.8	16.12
200	92.3	52.9	42.7	74.5	.0075	44.0	54.40

400	92.0	47.0	48.9	73.0	.0068	52.1	60.3
600	90.8	42.8	52.9	75.0	.006	55.4	63.3
800	91.2	40.8	55.3	73.5	.0058	59.6	66.61
1000	91.3	38.6	57.7	74.0	.0055	61.1	71.0
1400	....	....	....	75.5	....	67.3	77.7
	Series (b) Moisture before Pressing 75 p. c.						
0	....	....	....	74.0	.014	26.7	27.3
200	74.3	33.4	55.0	73.5	.007	46.5	59.25
400	76.6	31.3	59.2	71.5	.0065	52.7	65.95
600	74.7	29.6	60.4	74.0	.0062	56.5	68.5
800	75.6	28.2	62.7	74.5	.0062	57.6	72.06
1000	78.8	29.5	62.8	74.5	.006	60.0	62.9
1400	75.8	26.4	65.2	77.5	.006	63.1	....
2000	....	....	....	74.0	.0055	73.4	86.9
	Series (c) Moisture before Pressing 40 p. c.						
0	40.8	....	....	75.0	.009	26.8	43.85
200	46.5	19.1	59.0	74.5	.007	38.9	49.65
400	38.9	11.7	70.0	74.0	.006	40.0	51.9
600	39.8	10.8	72.9	75.0	.0055	41.0	55.46
800	42.1	10.9	74.1	74.5	.0052	42.0	57.15
1000	44.7	12.9	71.2	75.0	.0052	45.0	60.85

These results are shown in the form of curves.

Fig. 11—Curves Showing the Effect of Moisture-Content Before Pressing on Strength Developed under Different Pressures (Bursting Tests).

Fig. 12—Curves Showing the Effect of Moisture-Content Before Pressing on the Strength Developed under Different Pressures (Tensile Tests).

Fig. 13—Curves Showing the Effect of Pressure on Moisture for different original Moisture-Contents.

It may be said, from an examination of Figs. XI and XII that a moisture-content of 75 per cent before pressing is an optimum. The crossing of the 75 per cent and the 95 per cent curves in Fig. XI is rather hard to understand, especially when compared to Fig. XII. Unfortunately there was not enough time to check these two curves to clear the matter up. From the results of the tensile tests it seems reasonable to suppose that the curves should occupy the same relative positions in the bursting tests thus making 75 per cent the optimum condition.

That the 90 per cent sheets have a tendency to act rather erratically under the pressures is shown in Fig. XIII, where it is seen that the per cent loss in moisture increases with increase in pressure up to a certain point, after which it starts to decrease.

Summary

It has been shown that in the pressing of test-sheets in the strength-testing of pulps:

1—The strength developed is independent of the length of time the pressure is applied (within the limits of the speed of the machine used).

2—The strength increases with increase of pressure applied, other conditions being constant.

3—This increase in strength is more marked at the lower pressures used and on the lighter basis-weights of sheet.

4—The strength varies inversely with the basis-weight, other conditions being constant.

5—The strength varies independently of the moisture-content before pressing. For the moisture-contents used 75 per cent was found to be the optimum.

Conclusions

From the results of these series of tests it seems imperative that the basis-weight of the test-sheets used and the pressures applied in their formation should be accurately specified in any standard method for the testing of pulp for strength.

Economics of Lighting in Pulp and Paper Mills

BY J. H. KURLANDER

Lighting Service Department, Edison Lamp Works, Harrison, N. J.

THE engineering features of installation design for paper and pulp mills have been treated so thoroughly before that no effort will be made here to cover this phase of the subject in a comprehensive manner.

However it may be advisable to review, briefly, the essential requirements of any lighting system for the purpose of placing stress on these points.

Too much emphasis cannot be placed on the careful selection of such accessories as lamps and reflectors.

Incandescent lamps are available for industrial use in sizes ranging from 10 watts to 60 watts in the vacuum or Mazda B lamps and from 75 watts to 100 watts in the gas filled, or Mazda C lamps. The Mazda C lamps are more efficient than the Mazda B and the efficiency of the former increases with lamp size. Thus a comparison of a 110 ten volt 100 watt Mazda C lamp with a 110 ten volt 500 watt Mazda C lamp shows that the former emits 1,300 lumens of light while the latter emits 9,000 lumens. Figured in terms of efficiency, the above shows 13 lumens per watt for the 100 watt lamp as against the 18 lumens per watt for the 500 watt lamp, an increase of 38%. Or, in other words, one 500 watt Mazda C lamp gives about as much light as seven 100 watt Mazda C lamps. The curve in Fig 1 shows how the efficiency of Mazda C lamps increases with lamp size and from this curve, it is obvious that a great saving in power can be effected by using the higher wattage lamps wherever conditions warrant their use. The conditions necessary for the use of these large lamps are primarily a high ceiling and large work area. A high ceiling is required to enable the lighting units to be hung high, thus reducing the glare and also distributing the light over a large area. A large area is necessary in order to permit the use of a sufficient number of units so that light from a number of units falls on any one point. This makes for even distribution diffusion. Diffusion is also obtained by the use of bowl-enameled lamps. Bowl-enameling consists of spraying a dense, white, mineral coating on the lower half of the lamp, which acts to reduce the brilliancy

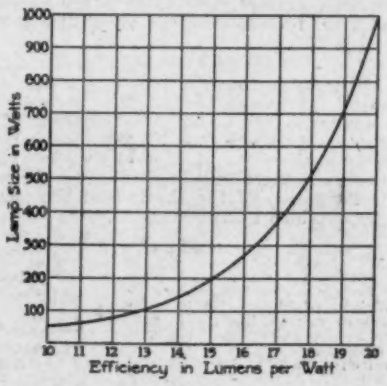

Fig. 1

of the lamp and also diffuses the light. The absorption of light due to this enamel is very small.

Proper Reflectors Important

In addition to lamps, proper reflectors are necessary for the following reasons:

1. To increase the light on the working area.
2. To shield the eyes of the workers from direct glare.
3. To reduce lamp breakage.
4. To reduce dust accumulation on lamps.

For economic reasons, nothing could be better than to standardize on the use of a few carefully chosen units which pulp mills, the following types would take care of all needs. would meet all requirements for mill lighting. For paper and

1. A dome reflector with deep skirt such as the R. L. M. Standard Dome Reflector for general lighting of workrooms.
2. A choice of either the elliptical angle or straight angle reflector for paper making machine and calender lighting.
3. A deep bowl reflector for local lighting, where such is required, and for extremely low hanging heights, such as are usually found in basements. This is necessary as otherwise the bright lamp would be in a direct line with the eye and would be decidedly glaring.
4. A good form of semi-indirect or totally enclosing glass unit for finishing rooms handling high-grade stock, office lighting, etc.

To the above could possibly be added a small 6-inch glass bowl reflector for toilets, wash rooms, stair landings, small rooms, etc.

In addition to the proper accessories for the lighting installation, two other points must be considered. One is installation design and the other is the intensity necessary to carry on work efficiently and accurately.

The matter of installation design was covered in the paper mentioned and as nothing new has been developed, which would tend to affect the data presented, no further mention need be made of it here.

The question of the proper intensity or amount of light required on work planes is often open to considerable debate. There is at present no accurate method of predetermining the correct intensity for a specific operation other than that based on experience. Upon the say so of presumably experienced persons often rests the matter of deciding upon a suitable intensity. This is sometimes a stumbling block when trying to convince persons of the desirability of using a higher intensity for particular operations, than that ordinarily used. A method will be outlined later which will indicate approximately a desirable intensity for any opera-

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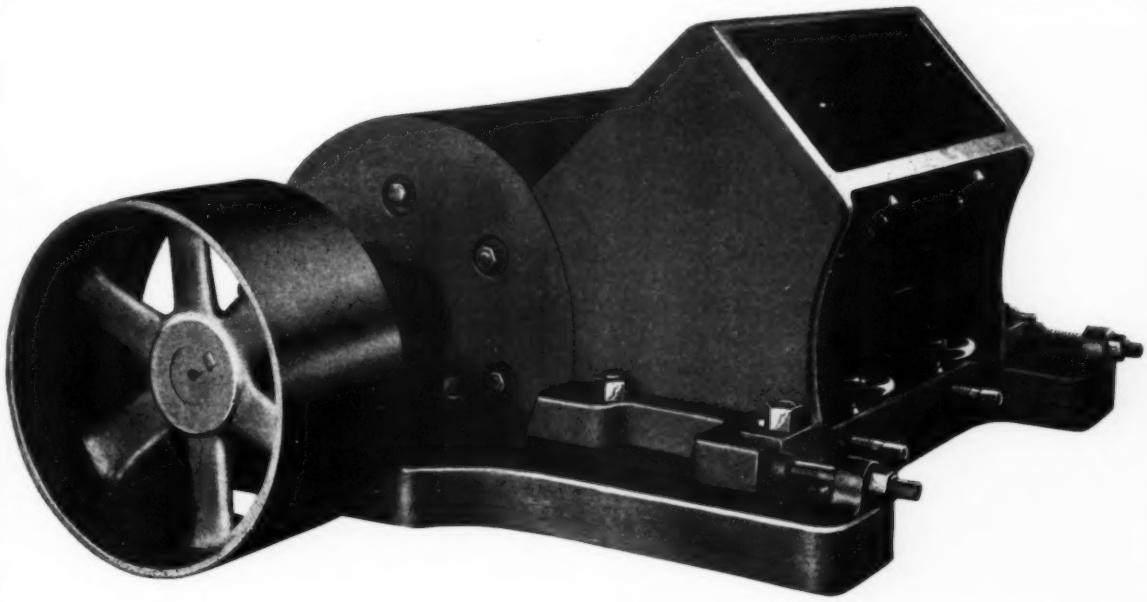

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tion. Suffice it to say, however, that tables of intensities have been compiled covering a large list of industrial operations, based on experience and observation, that will enable anyone to decide which intensity is proper for any operation.

Revamping Present Installation

It is not to be expected that when a plant or mill wishes to install modern lighting, it will immediately proceed to tear down the present wiring and lighting units and scrap the entire installation. Such a procedure would, in the majority of cases, prove prohibitive and altogether unnecessary. In some mills, no doubt, only minor changes would be required to bring the installation up to good practice. In others more elaborate changes would be required. Unfortunately there are many where major changes would be necessary to obtain the desired results.

When setting about revamping an installation it would be well to follow a course of action as outlined below:

1. Make a critical inspection of the system as to type of wiring, whether open, conduit, etc. This will determine the ease of relocating outlets.

2. Lay out, to scale, on rough floor plans of the mill, the location of present outlets and wiring. Mark each outlet with the size of lamp it contains and the reflector, if any, employed and approximate hanging height of unit. Also whether the reflector is fit for further use or is to be scrapped.

3. With these plans before you, figure out the intensity on the work plans as should be obtained with the system.

4. Then measure the intensity, in foot candles, actually being obtained, by means of a foot candle meter. This should prove enlightening as to the amount of light being lost, due to lack of cleaning, wrong voltage, etc.

5. Refer to tables of intensities and see what is required for the particular operation in mind. Check this with the calculated figures and what is actually being obtained.

6. Then see what additional outlets are necessary to bring the intensity up to the desired figure.

The last step is the most difficult as it means mostly a cut and try process of adding new outlets to the present system and by so doing it that the system, when finished, is fairly symmetrical, thus obtaining evenness of distribution.

The question naturally arises as to what material should be scrapped and what should be retained for further use. Certainly all old, battered reflectors which have lost their reflecting properties should be junked. If there is any doubt as to whether the reflecting surface has deteriorated to such an extent as would warrant its being thrown away, compare it with a new reflector and determine the extent of its depreciation.

Some classes of reflectors depreciate more rapidly than others. Such reflectors as have painted aluminum or painted enamel surfaces, besides being subject to a rapid temporary depreciation, also have a rapid permanent depreciation. By temporary depreciation is meant that the reflecting surface easily collects dirt and unless frequently cleaned, soon fails to serve its main purpose of redirecting light to the working plane.

Permanent depreciation is of the nature of peeling and discoloring of the reflecting surface. As distinguished from the types of surfaces mentioned, the porcelain enameled reflectors deteriorate much less rapidly, are easier to clean, and are usually more durable because heavy steel is used in their construction.

Another point worth mentioning, when any changes in an installation are made, is that of using the right size of lamp in the right reflector. For example, a 100 watt Mazda C lamp should not be used in a reflector designed for a 60 watt Mazda B lamp. The R. L. M. Standard Dome Reflector was designed for the use of the Mazda C lamp. Many of the older type shallow dome reflectors were designed for the use of Mazda B lamps. When Mazda C lamps are used in such reflectors they are glaring and the light utilization is low.

110 Volt vs. 220 Volt for Lighting Circuits

The question of whether to use 110 volts or 220 volts for lighting circuits brings forth some interesting information as to the comparative cost of these two systems. The advantages are entirely with the 110 volt installation for a number of reasons. It is true that a high voltage economizes on copper but the lamp is undoubtedly the most important element of the system. As the economics of lamp selection do not seem to be generally understood, a brief analysis will be made to show the desirableness of the 110 volt lamp over the 220 volt lamp.

It is not possible to make 220 volt lamps which are uniformly as good as 110 volt lamps. The filament of a 220 volt lamp is very much longer, and of thinner wire than that of a 110 volt lamp of the same voltage. This results in three things: an increased cost due to the increased labor involved in mounting the filament and also to the smaller demand for these lamps. A lowered efficiency due to larger radiation losses. Increased breakage of filament, due to greater fragility. That these factors are of considerable importance when considering the design of an installation is evidenced by the table below which shows the saving that can be effected by the use of 110 volt lamps in place of 220 volt lamps. This table is worked up on the basis of supplying a factory or mill of 100,000 square feet floor area with an intensity of 4 foot candles.

It is assumed that 300 watt lamps in R. L. M. Standard Dome Reflectors will be used and that the overall efficiency of the installation is 50%.

TYPICAL CALCULATION OF THE SAVING TO BE EFFECTED BY THE USE OF 110 VOLT IN PLACE OF 220 VOLT LAMPS

Voltage	110	220
Wattage	300	300
Lumens	4,900	4,300
Number of Units required	164	186
Net Cost per lamp ($2,500 contract)	$ 1.35	$ 1.60
First cost of lamps	221.80	297.60
Savings on lamps	76.20	.....
Approximate cost of reflectors, etc.	4.00	4.00
Total cost of reflectors, etc.	656.00	744.00
Saving on first cost of reflectors, etc.	88.00	.....
Total saving	164.20	.....
Per cent saving	15.7	.....
Fixed charges:		
Interest at 6% on installation cost	$ 52.64	$ 62.49
Depreciation at 20% on reflectors, etc.	131.20	148.80
Cleaning at $1.20 per unit per year	196.80	223.20
Total annual fixed cost	$ 380.64	$ 434.49
Energy (4,000 hours' operation per year at 1c Kw.-hr.)	1,968.00	2,222.00
Lamp renewals (4,000 hours' operation)	885.60	1,190.40
Total operating cost	3,234.24	3,856.89
Total annual saving	622.65	.....

This table is given merely as an indication of what can be accomplished in the way of operation economies on the one point alone. No doubt the question arises in some minds as to what can be done regarding those mills at present equipped with 220 volt circuits. It is impossible in a paper of this kind to give detailed calculations on this point. Suffice it to say, however, that a proportionate saving can be effected in a number of ways by changing or adapting the existing 220 volt circuits to the use of 110 volt lamps.

Some of these methods involve the use of one of the following:

1. Installing a motor generator set of the required capacity. By balancing the loads the capacity of this machine need be a small percentage of the total load.

2. By using a balancing coil or auto transformer. Here again the capacity need be but a small fraction of the total load.

3. By using a revolving compensator for modifying a two-wire, 220 volt D. C. generator to a three-wire, 110-220 volt machine.

It might seem at first thought that it would be extravagent to spend money for additional wiring and machinery merely for the sake of using 110 volt lamps, but in most cases the return on the money spent usually pays for the equipment in a very short while. Besides paying for itself, it also nets quite a handsome return on the investment.

The Economics of Good Lighting

One of the greatest drawbacks to the use of high intensity lighting in industrial plants has been the lack of sufficient data to show concrete evidence of the benefits which accrue to the users of such systems. It is well enough to talk vaguely of contented workers, greater safety, neater mills, etc., as the results of good lighting, but the plant owner is apt to reason, and rightly so, that if his mills were lighted well enough to insure safe working conditions and a fair degree of visual acuity to carry out the plant operations, why should he spend more money to secure light which apparently affords no money return. "I can't afford it," is a common excuse for not installing better lighting in many mills.

The principal object of this paper is to show that the money spent for securing light over and above that required for merely safe lighting is money well invested and capable of giving a return far above any sum required to change over to high intensity lighting.

High intensity lighting has in recent years been referred to as Productive Lighting. This, for the simple reason that a higher rate of production is possible under such lighting than under that merely sufficient for safety to workers. A numbers of tests, which will be discussed here later, show that production is actually increased under high levels of intensity. The reason for this is no doubt of interest to all of us. All of the objects used in the ordinary industrial plant can be

placed in one of two general classes. These are stationary objects and moving objects.

In the case of stationary objects, perception of detail is ordinarily of great importance. This can be illustrated by a simple test making use of a chart, such as that used by ophthalmologists, called a Snellens' chart. It consists of lines of letters, arranged without regard to order, but decreasing in size from top line to bottom line. At a given distance from this, which, when it is lighted to a given low intensity, a person is able to read down to a certain line of letters. When it is lighted to a higher intensity, however, invariably several additional lines of letters can be read, proving that under a high intensity, a person is able to perceive much finer detail.

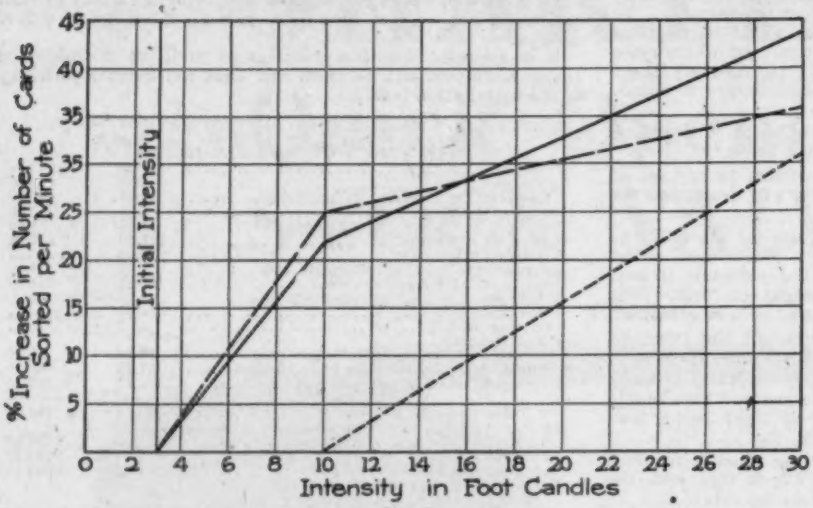


Fig. 2

In the case of objects in motion, the time element is probably most important. Consider a game of night tennis played on an artificially lighted court. If the lighting system is not properly designed to give high intensity and well distributed light, when the ball passes from a light area to a darker one it apparently gathers speed; conversely, when passing from a darker area to a lighter one, it apparently slows down. Translating this in terms of shop talk, it can be said that moving objects in a well lighted area or plant are more readily perceived than those in a poorly lighted plant. No doubt some of you have played baseball at twilight and have had the unpleasant experience of seeing the ball coming toward you too late to catch it.

Card Sorting Tests

There have been a number of experiments carried out by investigators which show that a definite relation exists between speed of vision and intensity. Data can be given showing that in a number of card sorting tests carried out by these investigators, increased speed of operation invariably followed a raising of intensity.

The results of these investigations, plotted as curves, are shown in Figure 2. They represent the results of a laboratory experiment in which cards bearing a faint triangular figure measuring about ⅛ inch on a side were sorted from other cards, some of which were blank and others having different figures. It will be noted that the curves constantly rise as intensity is increased.

However, mere raising of intensity is not sufficient to obtain this increased production. There are some instances on record where the lack of attention to the design of installation nullified the good effects of the high intensity and even acted to cause a falling off of production.

It may be well to mention the results of a test conducted under actual operating conditions in an establishment where sorting is part of the normal operation. In this test addressed envelopes were used and experienced operators sorted these as to geographical districts. Outlets for lighting units were provided where needed and then to secure increases in intensity the smaller units were replaced with larger ones until the largest size unit available was used. Totally enclosing units were used and the hanging height was maintained constant. This last fact is accountable for the ultimate failure of the installation. There was a constant increase in the number of cards sorted per minute until the intensity was raised to 14 foot candles and then a decided drop was noticed. The operators under the 14 foot candle installation complained of the light being "too bright." The lighting units for this particular intensity measured 18 inches in diameter and were hung only 11 feet high. As a result it seemed as if the entire ceiling were covered with lighting units and the installation proved to be very glaring. This point is brought out to show the necessity of co-ordinating the design with the intensity which too often is overlooked. An intensity of 14 foot candles is by no means too much light to supply for work involving such demand on the eye, if the installation is properly designed. It should be remembered the ordinary daylight intensities range from 50 foot candles in office rooms to several thousand foot candles out doors. Investigation of places said to be overlighted, will, if anything, prove that they are **glaringly underlighted.**

It might be mentioned here that card sorting was selected for the first test because of the demand made on the eye and also, because of the nature of the work, increases in production, so to speak, or rather "spread of vision" would show up readily with this class of work, with increases in intensity. The second test, however, as stated before, involved work as ordinarily performed in the normal operation of the establishment.

Increases in production are not confined to laboratory experiments and such work as card sorting. Proportionate increases can also be obtained in practically all operations involving manual effort where a fair degree of eye work is required.

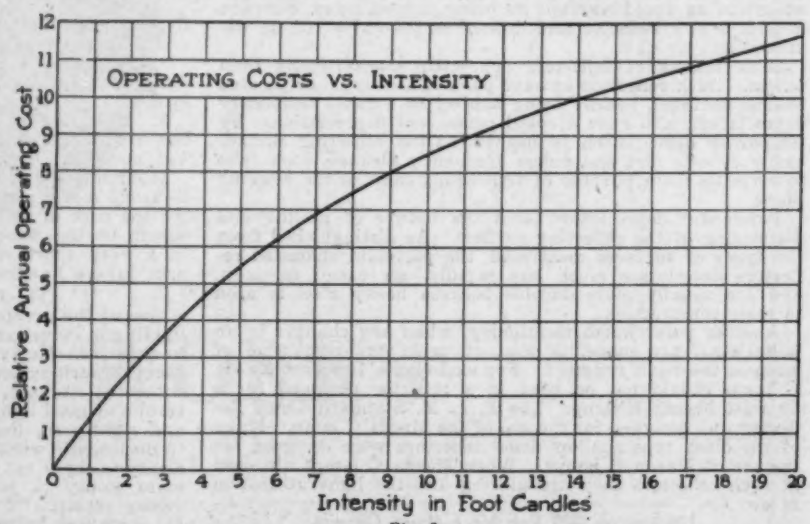


Fig. 3

The more eye work, so to speak, the greater will be the return on the money invested in more light. Operations in many other industrial processes are equally susceptible to these increases. That this is so is proven by the results of tests conducted in a number of shops where accurate records of production were kept before and after high intensity lighting was installed.

The following table contains a digest of these tests.

PRODUCTIVE LIGHTING TESTS

TEST NO. 1

Press Dept.	Old	1st increase	2nd increase	3rd increase
Intensity in Foot-Candles	0.7	7.0	13.0	22.5
Increase in Production	...	6.3%	22.5%	24.3%

TEST NO. 2

Semi-Automatic Buffing Dept.	Old	New
Intensity in Foot-Candles	3.8	11.4
Increase in Production	...	8.5%

TEST NO. 3

Iron-Pulley Finishing Shop	Old	New
Intensity in Foot-Candles	0.2	4.8
Increase in Production	...	35.0%

TEST NO. 4

Soft Metal Bearing Shop	Old	New
Intensity in Foot-Candles	4.6	12.7
Increase in Production	...	15.0%

TEST NO. 5

Heavy Steel Machine Shop	Old	New
Intensity in Foot-Candles	3.0	11.7
Increase in Production	...	10.0%

TEST NO. 6

Carburetor Assembling Shop	Old	New
Intensity in Foot-Candles	2.1	12.5
Increase in Production	...	12.0%

TEST NO. 7

Spinning Machines—(Textile Mills)	Old	New
Intensity in Foot-Candles	1.5	9.0
Increase in Production	...	17.0%

Most of the increases in these tests were obtained at an increased cost of approximately 1 or 2 per cent of the pay roll. In other words if you had a hundred men workers for you and then employed one more and this one man increased production by 10%, he would be a rather valuable worker. Why not let lighting do this for you?

Granted that the results of these tests afford proof that a very appreciable increase in production can be obtained by increasing the light under which work is carried on, the next question that naturally arises concerns the expense of obtaining such increases. Can these increases be obtained economically?

Total production can be increased in a number of ways. By employing more men, by using better machines, etc. The point, is, however, will the output per man or per unit of cost be increased? If not, then no increase in efficiency has been obtained.

A table of annual cost based on the use of a 100-watt Mazda C lamp per operator per 100 square feet of floor area shows the very small saving in *time* required to affect the cost of operation. It is assumed that the lamps burn two hours per day, 330 days per year.

Analysis of Operating Cost

Cost of Lamp (list, subject to discount)	$0.80
Cost of enameled steel reflector (list, subject to discount)	2.50
Estimate cost of wiring per outlet	6.00
Total first cost	$9.30
Interest on investment at 6 per cent	0.56
Depreciation on reflector and wiring at 12½ per cent	1.06
Power at 5 cents per Kw.-hr.	3.00
Cleaning at 3 cents per cleaning, two per month	.72
Renewal of lamp $\frac{600}{100} \times 0.80$	.48
Total	5.82

Wages for 8 hours per day, 300 days at 70 cents per hour are $1,680

Ratio of cost of lighting per man to wages $\frac{\$5.82}{1680} = 0.35$ of one per cent

These figures, which are based on assumed conditions less favorable than ordinarily found, show that if a workman saves three minutes time per day, due to correct lighting, the entire operating cost of the system is paid for. They do not take into account the much smaller differential between the cost of good and poor illumination. Surely any employee will lose much more time than this under an inadequate system of illumination, when it is necessary to go to an individual lighting unit to read his figures, or to adjust the lamp in order to see his work better.

A lighting system, when operating at a high intensity, also operates more efficiently and hence at a lower cost per unit than one under a low intensity. This is shown better by the curve in Fig. 3 which shows the variation of relative operating cost with intensity. As an example, suppose we have a 2 foot candle installation and we wish to treble the intensity making it 6 foot candles. The increase in operating cost will not be trebled but will be 2.4 times the cost of the 2 foot candle installation.

On the curve the 2 foot candle installation is shown as costing 2.6 relative units. The 6 foot candle installation is also shown as costing 6.2 relative units, and the cost of the latter over former is 6.2/2.6 or 2.4. Similarly for quadrupling the intensity, the cost is increased but 2.8 times.

So we see that productive lighting is something more than a mere catch phrase and is worthy of consideration on the part of the progressive plant managers and superintendents.

There are a number of places in the paper mill where productive lighting could be used to good advantage. The ragroom, machine room, finishing room, and packing and shipping rooms, all afford opportunity for securing the most from this great industrial servant. The finishing room particularly is well suited for such lighting as the operations in this department involve much eyework and it is here that most complaints of eye fatigue originate. The inspection and counting tables can well be compared with the card sorting tests mentioned previously.

Increases due to better lighting do not result from any driving action on the operators as the response to better light is natural and spontaneous.

Better working conditions are also obtained as eye fatigue is greatly reduced and efforts to maintain a cleaner, hence more sanitary mill are facilitated.

Why a Chemist in a Paper Mill

By DR. KARL A. SCHULTZ

Aside from mechanical treatment, the manufacture of paper and fibre board involves many chemical processes. Hence, the more this process is directed by proper chemical knowledge the better will be the results obtained. Yet many paper mill superintendents, even today, look upon the chemist as simply a theorist.

Chemistry is, indeed, based on theories, for without theory, without a leading idea no practical improvement can be achieved. The point is that science and industry must coordinate more closely and the better educated the man is the more easily is mutual benefit attained. The practical paper man and the chemist must co-operate without prejudices.

According to my experience chemical investigation in a paper mill can be applied in testing and combining raw materials, and improving the process of paper making by research and experimentation.

In the testing of raw materials the chemist should work closely with the purchasing department. If possible, agreements should be drawn up with every firm that furnishes raw material to the mill in which should be stated the specific test results which are required. Without any analytical standards agreed upon by both seller and buyer chemical analysis cannot show desirable practical results. Though the U. S. Government undertook many helpful researches in this respect, the standards hitherto worked out are not generally known or recognized by the industries.

Manufacturing concerns spend vast sums of money yearly on cost systems, etc., but chemical control is considered by many not a necessity. I know it is hard to introduce new methods and new views in the field of practical manufacture. Yet, I feel sure, there will come a day when no industry can meet competition without certain standards.

One large board factory, which I remember, found it impossible to get a definite statement from alum producers relating to the guaranteed percentage of AL_2O_3 or SO_3 the alum contained. Many of the firms did not even answer questions concerning this matter.

When I began work at a certain mill they used there an alum that contained 10% insoluble matter. This percentage, at the highest, should not be more than three tenths of 1%. Moreover the alum was put into the beater without being dissolved.

Besides alum, rosin size is perhaps one of the most important materials added to the beater load. Here we face the same difficulties in securing detailed statements, from the producers, in regard to the quality. We were merely told that the size was 60% and contained 20% free rosin. Analyzing this product I found a solution of only 53% resinate with a free rosin percentage of 3.7%. This product was a good one and cheap, considering its price, but it contained considerably less resinate than the producer reported.

It is always advisable to test incoming fuel. I refer the reader to Technical Paper 8, Department of the Interior, Bureau of Mines—"Methods of Analyzing Coal and Coke."

Paper making depends greatly on the quality of the water used. Water analyses are therefore necessary from time to time to obtain a uniform sheet. There are many other materials to be tested, but what I mention will be sufficient to show the importance of chemical work.

Chemical research work requires time and money, but where both of these are available it will pay sooner or later. The costs will be lowered considerably since the laboratory can be used at the same time for testing raw material and watching the process of paper making. There should, I believe, be at least two men employed. A thoroughly trained chemist should, of course, do all the supervising.

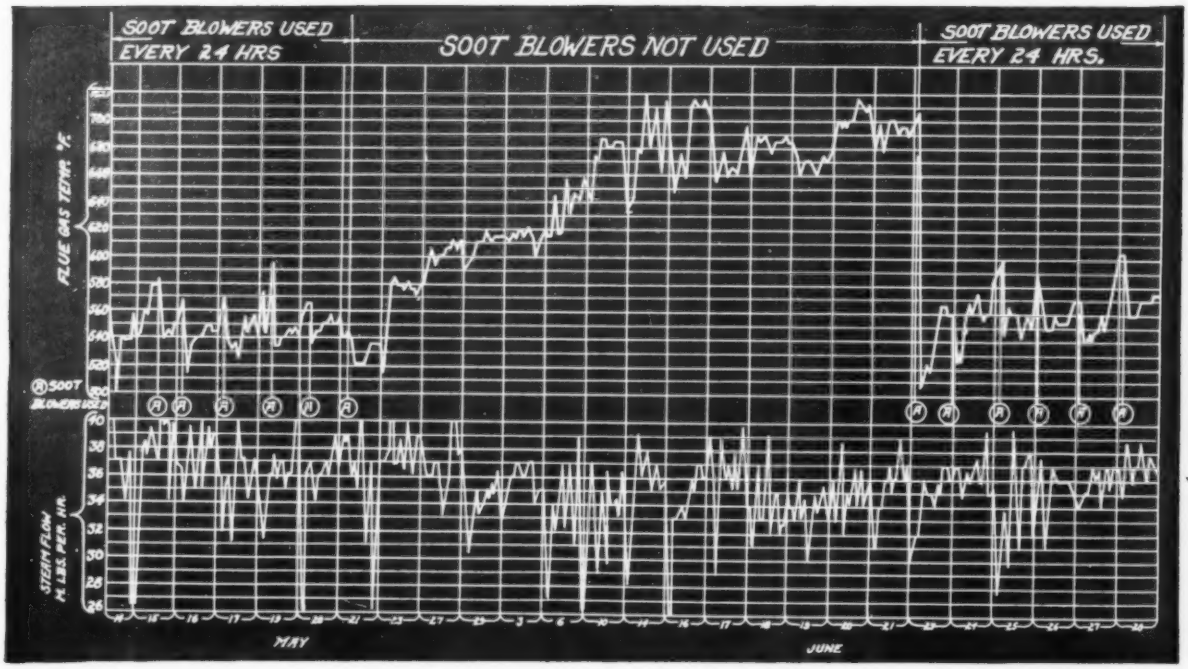
To make research work a success, it is necessary to lay before the chemist problems the solution of which will be of real value. Too many business men believe a chemist is a

WATERVLIET PAPER COMPANY, Watervliet, Michigan

Chart of Accumulation and Distribution of Operating Costs

DEPARTMENTS		Direct Charges						Equalizing and Fixed Charges										Auxiliary			Contributive				Central						Distribution		
		Mat. and Supp.	Pay Roll Labor	Pay Roll Liab. Ins.	Misc.	Total	Rate	Perish. Equip.	Losses on Inventory Share %	Losses on Inventory Amt.	Losses on Rel. Paper Share %	Losses on Rel. Paper Amt.	Depr. Amt.	Insurance Share %	Insurance Amt.	Taxes Share %	Taxes Amt.	Power and Steam	Repairs and Replacements Sups.	Repairs and Replacements Mach. Shop	Wells and Filters Share %	Wells and Filters Amt.	Yds. and Sid'g.	Stores and Hdlrs.	Office	Com'l	Investment Chges. Share %	Investment Chges. Amt.	Floor Space Share %	Floor Space Amt.	Grand Total	App'd Nor. Rts.	Computed Rate
Productive	Paper and Rag Stock	57000	242100	3000		302100	.43	1000	3.1	600	31.5	12700	38800	11.8	2300	22.2	23500	19300 271700	32300	16000	50.3	61000		24100	28900	42500	33.2	20600	39.5	31900	928700	Per Day 70000	Per Cwt. 1.33
	Making	58000	315200	3900		377400	0.41	4500	21.8	4200	42.4	17100	88100	24.1	4700	42.3	44800	368200	82300	39600	39.0	40600		24100	29500	69500	42.3	25500	41.7	33500	1253600	568.4	2130
	Calenders		135700	1400		136100	1.17		1.6	300	13.4	5400	9000	2 1	400	4.5	4700	84100	5800	2800					15500	18100	11.5	7000	7.2	5800	296000	1160.0	255
	Cutting		69700	700		70400	1.57		1.0	200	3.7	1500	1900	0.5	100	1 1	1100	1600	1400	900					8900	9400	6.3	3800	5.3	2700	103900	447 0	232
	Trimming	2100	37600	400		40100	1.82		0.5	100	3.5	1400	1800	0.5	100	1.0	1000	2300	1300	400					3000	5800	3.5	2100	1.5	1200	60600	221.0	275
	Packing		41200	500		41700	.93		1.0	200	1.5	600	100			0.4	400		200	100					1700	4200	1 0	600	1.4	1100	50000	447.0	115
	Stock & Ship.	200	37500	300		38000	.03				4.0	1600	1400	2.5	500	1.4	1500		1500	300					5700	6300	2.2	1300	5.4	4400	62700	P Da 50000	P.Cwt. .05
Central	Gen. Mfg., Floor Sp.		16000	200									11500	32.0	6200	9 3	9800	12100	4700	7600			12500						100.0	80600	2756400		
	Gen. Mfg., Inv.		35000	200									3500	5.6	1100	1 6	1700	6300	2500	8500	2.0	1500					100.0	60300					
	Commercial		120000	800	35000																					155800							
	Offices	9800	80800	400									400	1.0	200	0.3	300	1300							93200								
Contrib.	Stores, Handl'g		41500						30.0	5800			400	1.0	200	0.3	300							48200									
	Yds. & Sidings		10000													2.4	2500						12500										
	Wells & Filters												7800	0.5	100	1.0	1200	90000		4200	100.0	103100											
Auxiliary	Box Shop		20900	200					6.7	1300			1900	1.0	200	0.7	700	1500	300	1400	Unabsorbed only											
	Machine Shop	2000	68500	1200				800	13.5	2600			2500	1.0	200	0.4	400	3500	132600	81700													
	Power Plant	725300	86500						20.8	4000			31000	16.4	3200	11.2	11900	861900	To Genl. Stores														
	TOTALS	854700	1358200	13200	35000			6300	100.0	19300	100.0	40300	199900	100.0	19500	100.0	105800																

For Cheaper Steam Production Use Diamond Soot Blowers



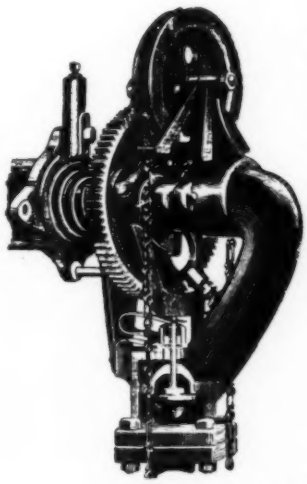
The chart above covers the results of a test made by a public utility on a 780 H. P. vertical water tube boiler, 225 lbs. pressure, 130° superheat.

The soot blowers were used once a day for a period of eight days after which the boiler was allowed to go without cleaning for thirty days.

It will be noted that as soon as operation of the soot blowers was discontinued, the temperature rose daily from an average of about 545° to about 680° at the end of the nineteenth day after which it maintained this same average for the succeeding eleven days. When the blowers were again operated an immediate drop in temperature occured from 680° to an average of 560° for the succeeding eight days. It will be seen that the load was fairly uniform throughout the test.

The extent to which Diamond soot blowers thus reduces the cost of steam production is obvious. The fuel saved by reducing the flue gas temperatures may be estimated at 1% for each 20° to 30° drop in flue gas temperature, depending upon the amount of excess air in the chimney gases.

On the basis of fuel saving, Diamond soot blowers are one of the best paying investments in the power plant. They pay for themselves many times over during their period of service.



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THE Nordberg Uniflow Poppet Valve Engine is the most logical prime mover, especially adapting itself for paper mill drives; for Nordberg has developed the Uniflow engine so that it will operate with lower steam consumption over wider variations of load than any other form of steam prime mover. It can be changed from condensing to non-condensing while in operation, and will utilize any available steam pressure, any available superheat and any degree of vacuum or work against any back pressure.

Nordberg Uniflow engines are built in standard sizes from 100 H. P. to 6,000 H. P., and in special sizes to meet your engineering requirements.

The illustration below shows a 15x24" Nordberg Uniflow Poppet Valve engine direct connected to a 200 K. W. generator.

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kind of a wizard; they expect from him impossibilities and miracles within the shortest time.

Chemical research work should be encouraged in every way. Results of great promise have already been accomplished by some industrial pioneers and such organizations as the Technical Association of the Pulp and Paper Industry. The U. S. Government has also done its share by building and maintaining the Forest Products Laboratory at Madison, Wisconsin. These efforts have not hitherto been appreciated by practical paper men as they deserve.

Chart of Accumulation and Distribution of Operating Costs*

By GEORGE K. FERGUSON
Watervliet Paper Company

THE purpose of setting up a chart of Accumulation and Distribution of Operating Costs is to translate the information available from the old plan of accounting into the information necessary for cost accounting so that it will correspond with the classifications of the operating accounts and the classifications of the operating or expense analyses; also for the purpose of determining the operating rates immediately, until the new accounting system is in operation long enough to revise the rates according to the actual charges made by the new classification.

Whether this chart (see page 1698) is called a Chart of Operating Costs or a Chart of Indirect Costs is whether or not direct labor is included in the rates. For our purposes today we will consider that we wish to establish Operating Rates and include direct labor in our determined rates.

The chart is set up on the basis of the fundamental principle that the cost of the product is to be determined on the basis of the routing of the orders, that the product is to be charged with the operating costs of each of the productive departments, and that the cost is to be based upon the amount of time put upon the product in each of the departments.

First off I wish to say that this chart before you was drawn up to illustrate the principles involved, and as many departments have been omitted and all other details, which are but refinements, excluded, it will be noticed that in some instances the figures are not in proper proportion. Such figures as the chart carries are for the purpose of illustration only.

The departments used are those which might constitute a one-machine book mill. The classifications of the headings are so clear that explanations are unnecessary; if the titles do not explain themselves the subordinate titles make the meanings thoroughly clear.

No trouble should be encountered with the direct charges, the rule to be followed is to carry all charges to the finest classification possible and to keep the amounts which must necessarily fall into the General Manufacturing Dept. for redistribution as small as possible.

Perishable Equipment is allocated arbitrarily to the departments using such equipment, losses in inventory are distributed largely on a basis of the place in which the various parts of the inventory are found and the amounts so located, and losses on rejected on the basis of direct expense in the productive departments.

Depreciation in the various departments is based upon the investment value of the equipment, but the depreciation of the buildings is placed in the General Manufacturing Dept. on the line which will later be distributed on a floor space basis. Insurance is distributed on the basis of the insured property and local taxes upon the assessed valuation of the different parts of the property.

We have finished accumulating charges and have a total accumulated on a horizontal basis which we must distribute vertically. At first this appears to be a difficult process, but is really more difficult to attempt to explain than to actually do. The basis of the apportionment is the difficult part of the job, but having settled upon the basis of the apportionment you will find that in many cases such as the power plant a subordinate chart will be required. The totals are then carried to the main chart. Whether or not subordinate charts are required for the balance of the departments to be distributed depends upon the particular job for which a chart is designed. In many cases the columns provided for "Shares" will be sufficient.

Approved Normal Hours are computed in the usual way, and as far as the figures on the chart are concerned they more nearly represent a month's operation than that of a year, although a full year's operation should be taken as a basis.

The chart is not perfect, and while it is meant to be complete, it is, after all, only suggestive, but the main classifications are very important and should be followed closely.

*Paper read before the Third Annual Convention of the Cost Association of the Paper Industry, Kalamazoo Valley Local Division, held in Kalamazoo, February 23.

Paper Pulp Recovery*

By L. M. Booth

AS PRELIMINARY to the recovery and use of paper making materials, let us:

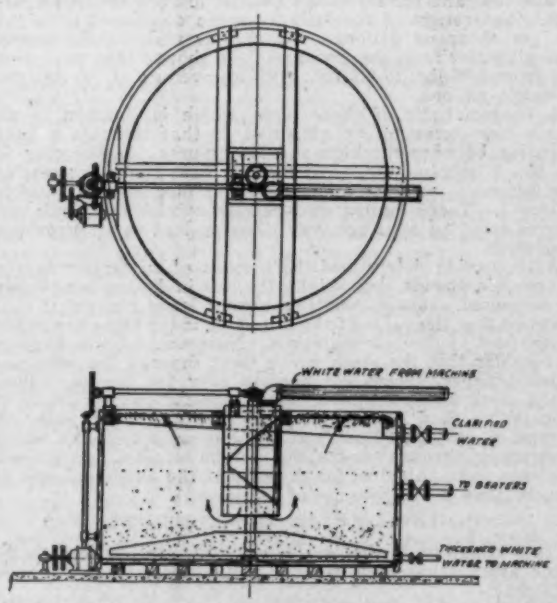
First, determine if any are lost.

Second, discuss the use which may be made of the reclaimed stock.

Third, consider the efficiency and cost of the recovery process.

In order to make a fair start in this important business, the only necessary equipment for the manufacturer who has not already tackled this problem is an open mind. Perhaps he has a general idea that the stock losses through the white water are more than they should be; still, he will have need for his open mind, for he will surely be surprised when he sees the figures.

About the only kind of a paper manufacturer who fails to react favorably to a suggestion as to the need for careful consideration of these wastes is an individual such as one of our representatives recently encountered. He said he didn't care to have a survey made to show him his losses through white water, because he wanted to "sleep nights." I venture



Pulp Saver

to state that he is the kind who is never very wide awake in the daytime, and will soon sleep in the cemetery, days as well as nights. With many manufacturers the notion prevails that there are considerable losses of pulp from the mills of their neighbors, especially if they are up stream, but when confronted with the idea that they may be wasting valuable paper-making materials, which may be profitably recovered—well, that is something different.

Recently, particularly during the past year, many superintendents, engineers, and chemists have come to realize that certain wastes are readily preventable. With this as a hopeful starting point, many mills have made surveys of their white water wastes to discover:

First, how much stock is being wasted, and

Next, to adopt the most efficient method of pulp recovery that is available.

In an investigation of stock losses in the excess white water that finds its way out of the mill, there are just two items to consider: first, the number of pounds of paper-making materials per thousand gallons of white paper, and second, the total volume of wasted white water. The result of an occasional test is usually misleading. Therefore, the record should be made to show the suspended solids from samples taken at least four times each twenty-four hours for at least four weeks. In the absence of other means for determining the volume of water, weir measurements should be made and recorded at least as frequently as the samples of white water are taken for examination. In some mills it is the practice

*Read before Michigan Division, Pulp & Paper Mill Supt. Assn., Kalamazoo, Feb. 15, 1923. Owing to illness, Mr. Booth was represented by Miss McGrath.

to report the stock losses in terms of percentage consistency. The objection to this is that the figures being so far to the right of the decimal point make the values look like rubles or German marks, and thus fail to create an adequate impression of their importance.

Using as a basis some thousands of tests of white water passing from save-alls to sewers, it has been found that the stock losses run from 1 lb. to 10 lbs. per thousand gallons. The lower limit is approached in the case of the white water carrying long fibers and in mills where the save-all equipment is maintained more carefully than usual.

Considering the fact that the stock in the white water has already been through the wire once, it is not unreasonable to suppose that it will again pass through a screen, if the opportunity is presented. Of course some of the pulp is caught—usually from 30 to 60 per cent of the applied pulp being retained by the mechanical screening device erroneously designated as a save-all.

Tests of White Water

The following is a summary of tests of white water made during 31 days in a mill using rag stock. During this period the mill chemist made 99 tests of the save-all waste water from their No. 1 machine. The minimum loss was found to be 0.18 lbs., and the maximum loss 7.1 lbs. per thousand gallons. An average of the daily averages was found to be 2.4 lbs. per thousand gallons. Ninety-four tests of the screen save-all water from the No. 2 machine showed that the losses ran from 0.03 lbs. to 3.8 lbs., with an average of 1.5 lbs. per thousand gallons.

A characteristic of these tests, which is common to all which have come to my attention, is that there is a wide variation between the high and low figures. In the case of the No. 1 machine, the maximum loss is 39 times as great as the minimum, whereas with the No. 2 machine the ratio is 127 to 1. These figures demonstrate conclusively that one, two or even ten tests are very likely to lead to an erroneous conclusion.

After having determined the amount of waste per day or per year in pounds, dry weight, the loss in dollars can readily be computed. It will doubtless appear large enough, if it is assumed that the value of the lost stock is the same per pound as the cost of the raw materials. However, a fairer basis is to consider that the stock which went through the wire was finished paper, except for passing over the dryers. Obviously, stock which has been beaten, bleached, sized, etc., is of more value than raw stock. For such grades of paper as require a well closed surface, the fine pulp and clay which have passed through wire, if they can be returned and utilized, are even more valuable, for the sake of the finish, per unit of weight, than is the average of the paper.

Use for Stock Reclaimed from White Water

This brings us to the consideration of what to do with the stock after it has been saved. Many superintendents maintain that:

(a) The stock which passes through the wire is practically all short fibers and therefore worthless.

(b) They tried to use the pulp settled from white water and abandoned it 25 years ago because it made the paper dirty, due to slime. Until you pin these fellows down, they would have you believe that the slime has something to do with the settling tank. Instead, as everyone who has given the matter any thought knows, it is merely paper-making materials which have adhered to a convenient surface and stayed there so long that decomposition set in.

While the above objections to a settling tank system seem formidable, fortunately there are good and sufficient reasons why, under proper operating conditions, these disappear entirely. I will discuss the objections separately.

(a) Fibers are short and worthless.

It is not to be assumed that paper is to be made using only this short stock. It should be remembered that the white water stock loss usually represents but from 2 to 5 per cent of the production. The addition of this amount of short fiber stock, distributed uniformly, will have no appreciable influence on the strength. Length of fiber alone does not insure a strong paper and the retention in the sheet of a small amount of well-beaten pulp can have no objectionable influence, especially since the surface will be improved. It will thus be seen that the importance of retaining this short fiber stock should not be minimized. Once it is in the sheet, it is worth just as many cents per pound as the longer fiber portion.

(b) Settled pulp makes the paper dirty.

The cleanest part of the stock is that which passes through the wire. This being the case, how does it produce the dirty paper we are told about? I will tell you; it is because they tried to make paper on Saturday out of pulp which should have been shipped as finished paper on Tuesday. The ordinary white water tank, used for beater supply in the average mill, is a sorry sight, especially on Sunday, when emptied and the whole of the slimy mass washed out into the river. Of course it is then too late to do anything with the decomposed cellulose, except to make it a subject of a belated inquest. We never attempt to make paper out of slimy pulp showing dark spots. We see that the pulp is made up into paper before it has a chance to decompose.

Next comes the consideration of an efficient recovery process. It is needless to dwell on the time-honored stock-saving methods. You are all familiar with them. It was with a view to preventing the losses and wastes incidental to the use of existing pulp-saving equipment that the process which I am now about to describe was developed about two years ago. The principles involved are by no means new. They are entirely familiar to all of us who have to do with the operation of mechanical filter plants, using coagulants in the purification of mill and other water supplies.

Chemical and Mechanical Coagulation

Paper stock can be recovered by chemical coagulation, followed by sedimentation, in much the same manner as mud and other objectionable substances can be coagulated and settled out of a dirty river water.

Fortunately the means, mechanical and chemical, for carrying out the process are at hand. Recourse is had to the use of a dry feed machine to feed Boothal, the complete coagulant. This coagulant has been successfully used for several years in the purification of low alkalinity water supplies.

Boothal contains sulphate of aluminum and an alkali. It is particularly well adapted for the coagulation of solid matter in waters which are close to the neutral point and, therefore, are of low alkalinity or low acidity. Having these characteristics, it will be seen that Boothal will be effective in the coagulation of the stock in a white water carrying the usual excess of alum found in the white water of a sized paper. Since the components of this coagulant are acid and alkaline, it is obvious that it may not be mixed and fed as a water suspension or solution, for the reason that the ingredients soon mutually react. Therefore, it is always the practice to apply the Boothal as a dry powder to the white water to be coagulated.

The first installation of this system of pulp recovery was in connection with an existing pulp reclaimer tank, where the efficiency of sedimentation was low, thus permitting a large stock loss. A well merited objection to pulp-saver settling tanks, depending on unassisted sedimentation, especially in book paper mills, is because of the tendency of the stock to adhere to the bottoms of the tanks. This trouble occurs even though the bottoms are conical and sloping so steeply as to retain only materials which will adhere when slowly deposited.

After a considerable thickness of pulp and clay has been built up on these steep, sloping conical bottoms, it will break away at intervals and slide to the apex of the cone bottoms. This, of course, has a tendency to increase the weight of paper-making materials in the thickened pulp. Because of the lack of uniformity of the thickened white water flowing from such a tank, it is obvious that it cannot be used directly back on the paper machine without influencing the weight of the paper.

Boothal coagulates the fine pulp and clay or other loading materials present so that these will settle more promptly than where plain sedimentation is attempted. In addition to this, the effect of the formation of the aluminum hydroxide precipitate produced is to prevent the adhesion of the stock to the tanks, piping, etc., so that the possibility of forming slime is practically eliminated.

One of the most suitable forms of tank for use in white water recovery is shown in the accompanying drawing. This tank is provided with a slowly moving agitator, traveling at the rate of approximately 3 feet per minute at the circumference. At this slow speed, no appreciable interference with the clarity of the water at the surface is caused. The white water, to which the coagulant has been applied, enters the central downtake conduit and is delivered to the lower portion of the pulp saver. After the thickened stock has accumulated in the lower portion of the pulp saver for a period, which is usually less than one hour from the starting of the paper machine, the outlet valve controlling the flow of thickened pulp from the bottom of the pulp saver is opened, and the thickened pulp may then be continuously delivered to the paper machine or elsewhere for use or to be stored.

In operation by this process, it is the practice to control the withdrawal of the thickened stock so that an amount corresponding to approximately 90 per cent of the paper-making materials in the white water are withdrawn from the thickened pulp outlet. This uniform draft, together with the continually slowly moving agitator, has the effect of maintaining

a high degree of uniformity in the consistency of the stock thus treated.

From a point higher in the tank, usually four or more feet above the bottom, water for beaters is withdrawn from the pulp-saver tank at intervals as required. The withdrawal from this upper level prevents the undue accumulation of stock in the pulp-saver tank. Usually from 6 to 9 per cent of the pulp is withdrawn from this upper level.

Due to the influence of gravity, assisted by coagulation, by far the greater portion of the pulp remains in the lower portion of the pulp saver. The result is that the clarified effluent usually contains less than 3 per cent of the amount of stock carried by the entering white water. It is the practice in a number of mills using this process to use the clarified water flowing from the top of the pulp-saver tank on the showers. In most instances, because of the high degree of uniformity of the thickened stock, it is introduced directly into the head-box of the paper machine, where its money value is the greatest.

Among others, the following kinds of papers are being made on machines equipped with Boothal pulp recovery process: Bond, Book, Bristol, Detail Drawing, Manifold, Bright Manilla, Manilla Envelope, Newsprint, Offset, Rope Stay, and Saturating Papers.

The Technical Section of The Paper Makers' Association of Great Britain and Ireland has recommended that the permissible loss of stock in white water be limited to the equivalent of 0.33 lb. per thousand U. S. gallons. This standard of excellence may be readily attained by the process just described. The cost of operation is from ½c to 1c per pound of recovered stock.

Waste in the Paper Industry*

By GEORGE BEARCE

News Print Service Bureau, New York City

THE question of stock saving in pulp and paper mills appears to be a live subject at the present and I appreciate the opportunity of discussing the question at this meeting of the Miami Valley Superintendents' Association. This interest may be attributed to the necessity of reducing costs as well as the desire to eliminate waste as far as possible. In some localities the stream pollution laws are claiming attention and are an important factor. Actual dollars and cents savings can be made by keeping usable stock from going down the river. The study of white water losses is one of the principal questions that the waste committee of the T. A. P. P. I. is considering, and perhaps some of the information that has been accumulated may be of interest.

The paper mill superintendent is primarily concerned with his quality and quantity production and the reduction of broke losses. This is essentially right because more production means lowered costs. It usually means safer running of the paper machine with less broke. Everybody is giving more attention to broke nowadays and records are kept by many mills to stimulate this interest and get the machine crews to keep broke losses to a minimum.

About ten years ago I was in a mill in New Hampshire and about the only record they kept was the weight of finished paper. It was an eleven and thirteen hour mill and I was on the 164 inch Pussey & Jones machine, hustling broke mostly. One night we had an especially hard run on 90-pound Manilla wrapping and that old machine kicked and bucked from seven until eleven-thirty. You know how 90-pound wrapping will pile up. When she steadied down we were a tired crowd and as it was the custom of the machine crew to take our naps in relays, three of us quickly found a convenient pile of broke and went to sleep, leaving the machine tender, third hand and winder to watch the machine. The rewinder man didn't intend to keep awake anyway and the third hand, watching the drying end, was just like the proverbial colored gentleman, "he just naturally went to sleep." I guess the machine tender must have dozed off, too, because about one o'clock she snapped off between the dryers, and calendar stock piled up on the floor for twenty or thirty minutes before anyone awakened to give the old shrill whistle that brought us all to the palms of our feet again. It's lucky for us that no records were kept that night.

At the present time, the white water from many mills slips down the sewer as easily as that broke piled up in the machine room, and moreover, the waste water fibre is gone because you can't put it back in the beaters. It is a loss that isn't noticeable like broke and one that is difficult to figure in dollars, yet it is a thing that the superintendents should be interested in, and they should insist on records of the sewer losses.

The amount and value of stock that can be reclaimed varies, of course, with the grade of the paper. Probably news, book and board mills are the most serious offenders in contaminating the streams with good fibre, although there are appreciable losses in mills making other grades. Many contend that they have a system that saves everything, but if all the overflow pipes and ditches in the average mill are examined it is generally found that the waste water that is going away from the mill is twice the amount estimated and the reclaimable fibre would represent a good many dollars in the course of a year. In the reclamation of stock the first essential step is to determine just how much water is leaving the mill and the percentage of fibre in the waste water. This may indicate both an excessive stock loss and high fresh water consumption. In a study of water conditions in the machine and beater rooms it may develop that in a number of places white water can be substituted for fresh, thereby making a double saving of fibre and water. In a board mill in the East a thorough study of this problem and the adoption of special white water shower pipes resulted in a reduction of fresh water consumption of from about 4,500,000 gallons to approximately 3,800,000 gallons per day. White water is used on the rotary screens, showers and cylinder moulds. About the only place where fresh water is used is on the felts.

Must Keep Save-All Clean

After all possible white water has been re-used the question of save-alls should be considered. There are a number of good makes of rotary screen save-alls that are giving satisfactory results. The inclined screen save-all can be used to good advantage on some grades of stock. Any save-all must be kept in order to get results. If you want to go anywhere with your Ford, you must keep your spark plugs clean and the machine in order. Then, as the saying goes, it will take you there and get you back. The same idea applies to a save-all and the right machine properly cared for will save money. Available figures indicate that it is possible to reclaim from one per cent, to four per cent, of the total stock furnished, depending on the grade of the paper.

After white water passes through a save-all, it is still of value and this is especially true in book and other mills using a large amount of filler. If you get a 50 per cent retention, and that is often the case, where does the other half of your clay go? Some goes back in tray water but a large amount down the sewer. The settling tank is about the last word in stock saving and has given extremely good results in a number of cases. The use of a coagulant to assist settling has proven very effective in some cases. There is a specially prepared chemical coagulant on the market that has given good results and we know of one mill that is treating the water going to the settling tanks with about five grains of alum per gallon.

The conical type of settling tank is ranked as the best, and if properly designed and operated will take about everything out of the water that is avoidable—except the "squeal." The upper section of the tank has a secondary cylinder, a little smaller in diameter than the main tank. The white water enters the space between the inside cylinder and the side of the tank, circulates downward into the main section of the tank, gradually moves upward and the excess goes out through the overflow at the top. The settled stock is drawn off at the bottom of the tank, the water used to furnish beaters, etc., is taken off about half way up the tank and the water near the top of the tank is suitable for showers. This description applies to continuous sedimentation tanks in general, although the detailed arrangement may differ in the various makes.

The intermittent settling tank system is also used by some mills. One company in Massachusetts has a series of wood stave tanks, and after allowing the waste water to settle about one and one-half hours, pumps the thickened stock to the heaters and the remainder to filter beds. This special installation was necessary to comply with the very strict laws regarding stream pollution, and the health authorities make regular tests of the waste water going back into the river.

How Much Fibre in Waste Water

To what extent it is possible to save fibre from waste water may be judged by recent findings in England on the subject. The attainable standard adopted as the ideal was one-third of a pound of stock per 1,000 gallons. We have figures from one or two mills in this country showing losses as low as one-half to three quarters of a pound per 1,000 gallons of waste water, but the large majority show losses that are five to fifteen times the above attainable average.

Assuming that it is possible to save two per cent to four per cent of stock from going to the sewer, what does this

*Paper, in part, read at the meeting of the Miami Valley Division of the American Pulp and Paper Mill Superintendents Association, held in Middletown, Ohio, February 24, 1923.

mean in dollars? One mill making low grade book assumes a value of two cents per pound for their reclaimed stock. With original furnish valued from three and one-half to four cents a pound this seems a conservative estimate. On the basis of two cents per pound and with a two per cent reclamation of stock, the saving for a 100 ton mill would be $100 per day, or a dollar per ton of production. Some mills estimate their losses as high as eight or ten per cent per ton of product.

The fibre in waste paper is somewhat of an elusive article, but it is not difficult to determine and check. A home made weir in the sewer to check the volume of flow and occasional samples for consistency tell the story. If it is possible to use a liquid level reporter and an automatic sampling device, the record is easier to obtain. With an automatic arrangement with which to measure and sample you have an equipment that is the "watch dog" over the fibre waste in the mill. I came across a good example of this in a news mill a short time ago. The waste water from the machines was sampled by an automatic water wheel device. Every few days the report by the chemist, that came to the manager's desk, showed an excessive fibre loss. Upon investigation it was found that one machine occasionally had trouble during the night, blamed it on the stock and would sluice about a half a chest full down the sewer. Of course, this is not a common occurrence but accidents occur in the best regulated families. If save-alls are used in a mill, a test of sewer losses serves as a check on equipment that is not properly operating. It isn't necessary to employ a whole army of "sewer rats," as one old operating man termed the chemist who was working on white water losses. A small amount of one man's time, together with a little equipment, is all that is necessary.

In conclusion it might be well to summarize some of the salient points on the reclamation of stock in the waste water of pulp and paper mills.

It is of value to the superintendent from a cost and operating viewpoint to make:

First—A careful survey of the mill to determine the volume of waste water going away from the mill and the stock and solids per 1,000 gallons. Are you losing less than one per cent of fibre per ton of product? Water is such a common substance in a paper mill and used so extensively that we don't realize what is in it until a test is made.

Second—The easiest and most effective way to save both stock and water is by the greater re-use of white water. Is it being used in every available place and is your fresh water consumption less than 15,000 gallons per ton of paper?

Third—Although most save-alls are more or less automatic they need the care and attention given to any machinery. The only way to know whether a save-all is really saving is by an occasional test.

Fourth—The save-all is an effective guardian of the unsuspected fibre losses from a paper mill and the continuous testing and recording of white water losses is a positive method of checking both the operation and performance of stock saving machines.

Fifth—The original investment in stock saving equipment is not excessive and the cost of operation and upkeep is only a fractional percentage of the value of material saved.

Sixth—In the final analysis, it is really the operating superintendent who will save stock in the mill. His interest in the save-all equipment and the amount of fibre and water going down the sewer will be indirectly reflected in his costs.

I have attempted to give my impressions on this subject and a few figures. The Committee on Waste in the Paper Industry is compiling a large amount of information on this subject that will be available in the annual report at the annual meeting of the T. A. P. P. I. in New York, next April, and we will be only too glad to cooperate in every way on the study of this important subject.

How Charges of Repairs, Replacement and Equipment Affect Cost*

By G. T. JUBB
Kalamazoo Paper Co.

YOU are accumulating each year depreciation and what are you doing with it? You are creating a reserve for replacement that has grown from year to year depending on how long your plants have been in operation. But we are getting to a point now where our plants have been practically or are being practically reduced to the Old Dollar Value. Now what are we going to do to retaliate this? What are we doing? Are we throwing a lot of stuff into repair expense? Are we letting the bookkeeper get away with it? Do you know the difference?

I am reminded of a story of a couple of Dutchmen—one by the name of John and a painter by the name of Jake. They were walking down the street one day and John said, "Well Jake, what are you doing?"

Jake: I'm in the painting business now.
John: Oh! Is that so. Well, Jake, I have a buggy I want painted.
Jake: Well John, I paint 'em buggy for you.
John: All right Jake.
Jake: What color I paint 'em buggy, John?
John: Oh! I don't know Jake, any color.
Jake: Well John, you like red, I paint 'em buggy red.
John: All right Jake, you paint 'em buggy red.

And so it was decided and John goes down the street but Jake called him back.

Jake: What color I stripe 'em buggy, John?
John: What color you think, Jake?
Jake: Well, John, you like red, I stripe 'em buggy red.

That is about like the bookkeeper handling those repair items. Sometimes he does not give them any thought. It is money spent. It is gone and he throws it into repairs without any regards as to how it is going to affect cost.

As I have said we make charges for depreciation to depreciation expense, but when we get a bill for a substantial repair we pay no attention to it as far as having previously made provision for that expense. So consequently we are charging our cost for this item twice.

There is only one way that we can make depreciation really stick with the Government and that is to make substantial charges against that depreciation which we claim has an effect and we must establish those accounts with the Government.

As far as replacements are concerned, we think that if we have a reserve for replacement that when we make replacement of a machine in our plants we should wipe out from the books the cost of the old machine, clear the depreciation that is not charged off on the reserve and further than that, if the reserve is big enough and we find that it is getting too big, we should charge the difference against reserve for depreciation and not take it as an item of expense.

Theoretically that may be wrong and perhaps it is, but we must get rid of some of the reserve for depreciation. It is getting too big and our plants may be worth many times what the net value shows on our books.

*Paper read at the Third Annual Meeting of the Kalamazoo Division of the Cost Association of the Paper Industry, held in Kalamazoo, Mich., February 23, 1923.

Technical Control in Relation to Costs*

By ELBERT G. MILHAM
Technical, Director Bryant Paper Company

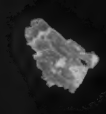
IN APPROACHING this subject, I am reminded of the oft repeated words, "It Ain't What We Don't Know; But What We Know That Ain't So." It is barely possible that the manager is occasionally reminded of these same words when the perpetual inventory as submitted by the cost department shows some three hundred tons of clay on hand and a personal observation in the clay bin shows something like three hundred pounds or thereabouts. When such things as these happen, and they certainly do in the best regulated of families, there must be some reason for it. In my humble opinion, one of the most important causes of such unpleasant occurrences lies in the fact that the cost department often fails to give adequate attention to the material aspect of cost work. Primarily, the cost man deals with figures; but fundamentally he deals with commodities just as the technical man does. If, when he is handling cold figures, the cost man is unable to visualize commodities as they pass from one form to another in the plant, he had better get a pair of glasses because any cost accountant who owns a pair of eyes that look but cannot see is a positive detriment to any cost system and paper mill office.

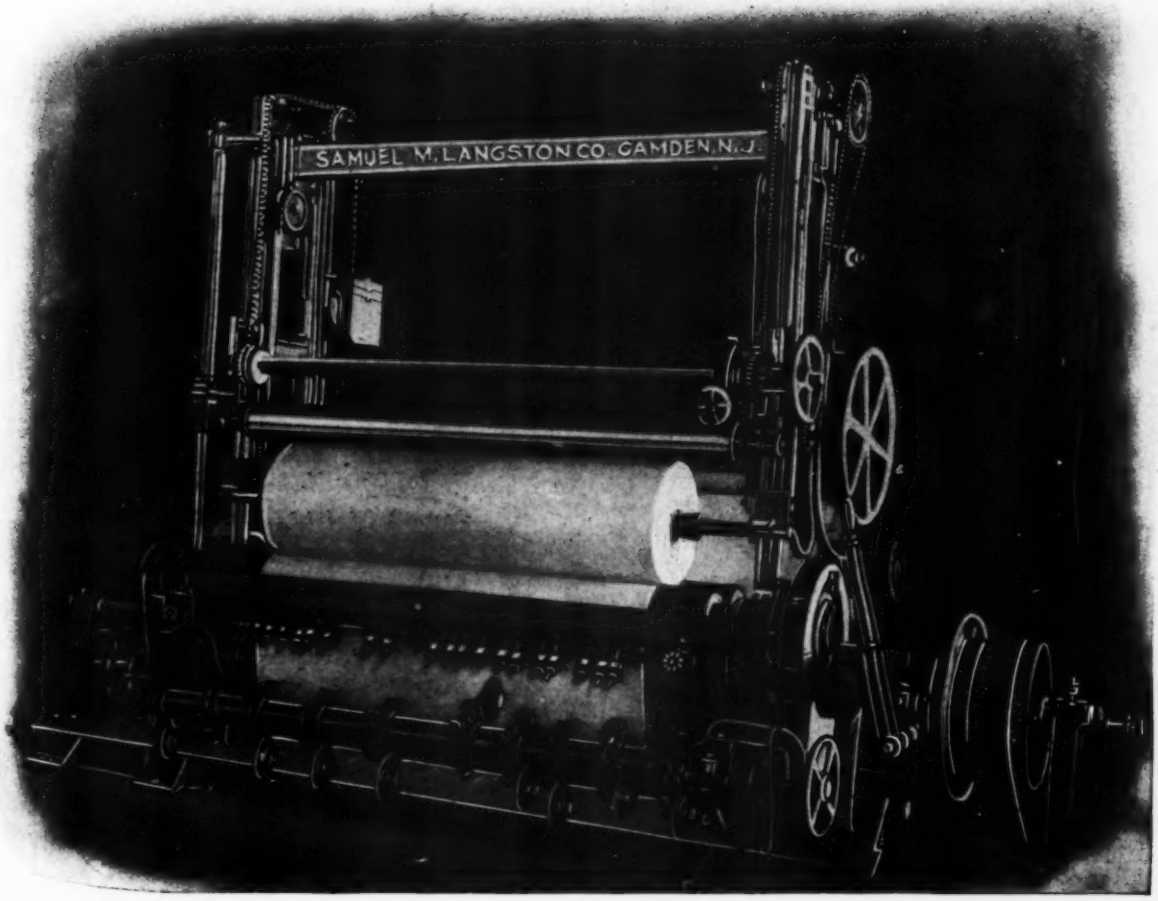
Now, assuming that we have a cost accountant who can see the figures that he deals with, let's see what the technical man can do to lighten his burdens and make his work more effective. We will divide these helps into three classes: Mechanical, chemical and personal.

Mechanical

This afternoon we learned something about setting the machine hour rate for a paper machine. We learned that such items as steam, power, and water made up somewhere in the neighborhood of one-third of this rate. It is obvious that any items amounting to as much as one-third of the total must be fairly accurate if the total is to be at all reliable. How is the cost man going to determine accurately the amounts of these very important items (steam, power, water)?

*Paper read at the Third Annual Meeting of the Kalamazoo Division of the Cost Association of the Paper Industry, held in Kalamazoo, Mich., February 23, 1923.





This shows an 82" Type "BA" Slitter as a WINDER

In the Mill of Analomink Paper Company, North Water Gap, Pa.

ALL steel gears—Roller Bearings throughout—Koegel Cutters (ball bearing)—quick acting cone clutch mounted on a live shaft—makes this an ideal machine for a narrow paper machine.

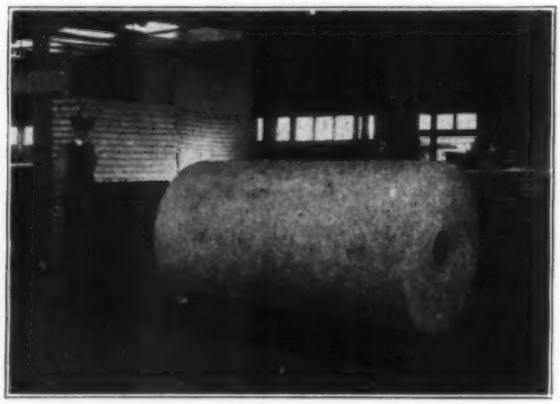
Shear Cut *Clean Cut*

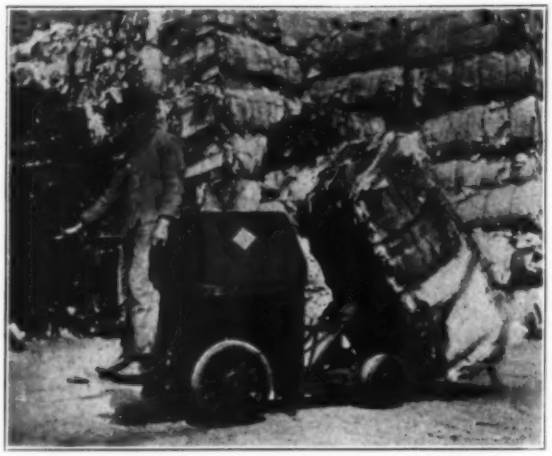
Samuel M. Langston Company

CLEAN SHEAR CUT CUT

Camden, New Jersey U. S. A.

If it's Roll Paper to be Moved





ELWELL-PARKER

can furnish the Electric Truck to deliver just where wanted

ROLLS are handled in pasting, shipping, warehouse or freight car. Rolls are upended or stacked two high automatically.

And for handling sulphite, paper-board, wall-board or felt Elwell-Parker load carriers are standard.

As some have said:

1. "Electric trucks saved us six men in addition to moving stock much quicker."

2. "Before purchasing an electric truck, it required six men to load fifty tons in one day, now five men handle eighty tons per day."

3. "Electric truck loaded eighty-one tons in eight hours, each load averaging approximately one ton, and the hauling distance from finishing room to cars is approximately 300 feet."

THE ELWELL-PARKER ELECTRIC CO.

CLEVELAND, OHIO

Offices in Principal Cities

Use meters, I hear someone say: Oh! the tragedy of it. Listen to a word of solemn warning. "Put not your trust in meters." For, unless there is a technical man around to check up these meters carefully, skilfully, intelligently and frequently these same innocent looking meters will give results about as reliable as some people's income tax returns.

Not so long ago I was talking with a man who was bragging about the enormous evaporation of 12½ pounds of steam per pound of fuel, which he was obtaining in his boiler plant. Ridiculous! Of course it is. Yet this poor deluded soul was letting a trusted meter deceive him into believing that he was obtaining a boiler, furnace and grate efficiency of nearly 90%.

From the foregoing, it is obvious that the cost man can well afford to forget his dignity long enough to call on a mechanical man for help in such mechanical matters as the following:

1. Distribution of power charges in all departments intelligently and accurately.
2. Distribution of steam and water charges in all departments.
3. Inspection and testing of all measuring devices used for the above purposes.
4. Frequent inspection and testing of weighing apparatus.

Chemical

Now that the cost man has sacrificed his dignity and learned about four ways in which a technical man can be of help in solving problems of a mechanical nature, let's see if the technical man can be of any service when it comes to dealing with problems concerning chemicals and other direct materials.

In the case of mills working old papers, we have the preliminary processes of sorting and cooking, washing and bleaching. The first three of these processes are essentially mechanical. The chemical used (soda ash) is a standard product, put up in bags holding a standard weight of material, consequently it is only necessary for the cost man to keep track of the number of bags of soda ash used per unit weight of old papers. However, when we come to the bleaching process, we have to deal with a material which is not so easy to keep track of as soda ash. In the Kalamazoo Valley it is essentially standard practice to purchase bleaching powder of unknown strength, extract it with water to obtain a liquor of unknown strength and measure this liquor by volume into the washer. In some mills an attempt is made to control the strength of the bleach liquor by means of a hydrometer test. Such a test, however, is positively misleading because there is no definite relation between the hydrometer test and the active chlorine in the bleaching liquor. If it is desired that the actual amount of bleach used per unit weight of papers or rags be known, it is necessary that the strength of the liquors be controlled by means of daily analyses, which may be made at a very low cost.

After the old papers or rags have been prepared, the next problem we encounter is that of keeping track of them as they are furnished to the beater along with the other raw materials. This matter of beater furnish has justly been termed the "cost man's Bugaboo." Since, in the Kalamazoo Valley, it is the practice to pump the paper stock to the beaters in slush form, it is impossible to determine the quantity of papers except by difference. This means that the total load per beater must be determined. Here is one of the places were technical control comes in mighty handy to the cost man. The advantages to be obtained from holding beaters at a uniform consistency are obvious, and it is within the power of the technical man to keep the consistency essentially uniform although the methods used to accomplish this end are very interesting, a detailed discussion of them here would require too much time. Suffice to say, however, that beater consistency can be controlled to such an extent that actual beater furnishes can be determined with a fair degree of accuracy if proper precautions are taken.

Next to paper stock, the most difficult material to determine is rag stock from the drainers. Here again the technical man is apt to come in handy by determining the air dry weight per unit volume of rag stock as it is measured into the beater. While in theory it is an extremely simple matter to sample and test a drainer of rag stock, it is a very difficult matter in practice, and one requiring the exercise of considerable skill and judgment. However, it can be done satisfactorily at a cost which is not really excessive.

Another material which we meet in the Kalamazoo Valley is wood pulp in all sorts of forms. The measuring of this material to the beater is a relatively simple proposition since the volume of pulp remains essentially constant, regardless of the variation in moisture content. It is only necessary to measure the pulp into the beater by volume and have the technical department determine the relation between volume and air dry pulp.

The next important material to be measured into the beater is rosin size. This is usually introduced in the form of a dilute emulsion of free rosin in rosin soap. If it is desired that the weight of dry size introduced into each beater be a known factor, it is absolutely essential that the strength of the size milk be carefully controlled. Attempts have been made to control the strength of the size emulsion by means of hydrometer tests. These tests, however, are extremely unreliable, especially in cases where relatively dilute emulsions are used. The only way to control the strength of size milk accurately is by means of daily analyses which are not at all difficult or expensive to perform.

Closely related to rosin size is alum. In some mills the measurement of this material to the beaters is greatly simplified by dumping it into the beaters dry. However, I would just about as soon think of feeding a six months old kid on corn beef and cabbage as to think of feeding dry commercial alum into a beater of book or writing stock. Alum should by all means be dissolved and added to the beater in liquid form. The weight of dry alum per gallon of solution may be fairly accurately controlled by means of hydrometer tests.

In Book Mills, clay is a very important part of the beater furnish. This is usually introduced in the form of a thin suspension of one to two pounds per gallon. In my opinion it is absolutely impossible to know anything about the clay furnish without the aid of technical control. In this case, the technical man must see to it that a clay emulsion of absolutely uniform consistency is sent to the beater room at all times so that a given volume of the mixture will always contain an absolutely definite weight of dry clay.

Fillers other than clay need no preliminary preparation and may be weighed directly into the beaters in the dry form.

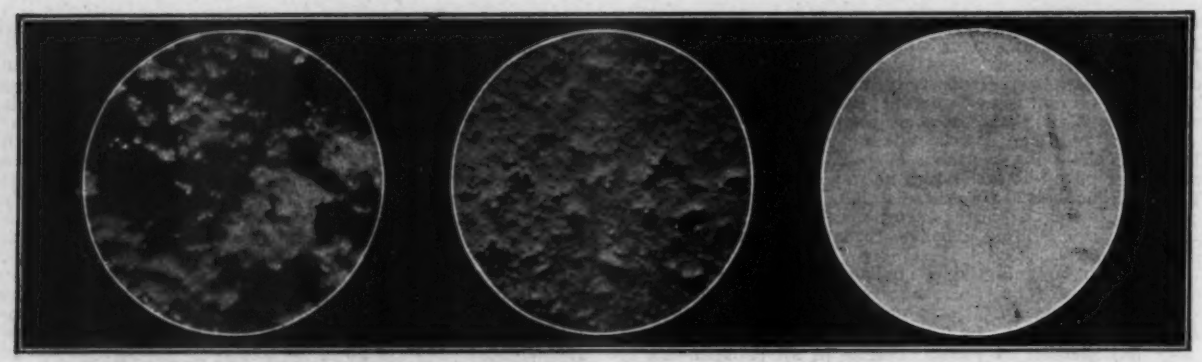
After the beater has been furnished, about the only remaining thing which the cost man needs to know about the direct materials is their retention in the finished paper. There again, the technical man comes in handy. He knows the folly of estimating retentions on the basis of haphazard tests conducted from time to time during the week. He knows full well how retentions fluctuate due to controllable and semi-controllable causes. But, most important of all, he is in a position to minimize these fluctuations and to keep the cost department constantly advised as to just what is happening to various materials which are so carefully measured into the beater.

Personal

The third class of assistance which the technical man can render to the cost man is labeled personal for want of a better term. The cost man works in the office and does not understand processes except in a general way. The superintendent stays out in the mill and is not interested in figures except in a general way. Now, if the superintendent gets it into his head, for example, that the addition of a lot of extra alum to the beater will make his paper run better on the machine, he will calmly use that extra alum and let the cost man rave about alum consumption until he is black in the face. If there is a technical man around the place when such a thing as this comes up, he will promptly make a complete investigation and if he finds, as he frequently does, that an unusual set of conditions has arisen which require the use of additional alum, he can demonstrate to the cost man, in terms of figures why the apparently excessive use of alum is profitable to the company. However, as soon as the unusual conditions have been overcome and normal conditions have been restored, the technical man is able promptly to demonstrate to the superintendent by means of very convincing tests that he is not only wasting valuable alum but is making his stock strongly acid and thus causing excessive depreciation of piping, pumps and other apparatus. It's easy enough to see how it works, the technical man substitutes facts for fool opinions and, in so doing keeps the cost man and superintendent on speaking terms with each other and at the same time uses materials when they can be used profitably and conserves them when it is at all possible to do so. What applies to alum can be applied equally well to every other material used in the paper.

Let's review the above now and sum up in a few words the various places where the cost man can call upon the technical department for assistance. These are:

1. Technical details concerning accurate measurement of such items as steam, power, water and all direct materials.
2. Technical details concerning actual operations and the consumption of materials both direct and indirect.
3. Explanations and adjustments between the operating and accounting departments.
4. Large increase in "what we know that's so" and, we hope, a slight decrease in "what we know that ain't so."



FLAT-FINISH WHITE PAINT — EGG-SHELL FINISH — BARRELED SUNLIGHT

These photographs were taken through a powerful microscope. Each was magnified to the same high degree. They show clearly why the surface of ordinary flat-finish white paint soils so easily. It is actually rough, uneven, porous. The smooth finish of Barreled Sunlight resists dirt and can be washed like tile.

The most surprising paint tests ever made

They explain why Barreled Sunlight is used today in leading paper mills

LOOK at it through the microscope—and you'll find why most white paint collects dust and dirt!

Examine Barreled Sunlight under the same conditions—and note the difference!

This and several other remarkable paint experiments are shown on this page. They explain why Barreled Sunlight is being chosen today as the interior white by leading paper plants throughout the country.

Barreled Sunlight produces a surface so smooth that it resists the smallest particles of dust and dirt. Even after years of service, it can be washed clean like white tile.

Made by our exclusive Rice Process, which removes the yellowing tendency from the oil, it is actually guaranteed to remain white longer than any gloss paint or enamel, domestic or foreign, applied under the same conditions.

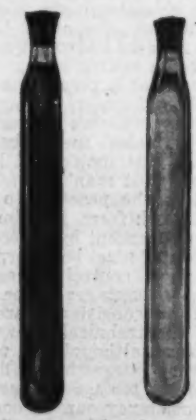
Mill owners who want walls that *remain* white without frequent repainting have found Barreled Sunlight in a class by itself. Furthermore, actual tests prove that Barreled Sunlight costs less per square foot of wall space than ordinary interior whites.

For heater rooms and places where excessive fumes prevail, Chemic Enamel, a special form of Barreled Sunlight, is recommended. This is smooth and washable also.

Barreled Sunlight contains no varnish. It flows freely and may be applied by brush or spray. Will not chip or scale. Sold in barrels and in cans. Where more than one coat is required, use Barreled Sunlight Undercoat. Send for our booklet, "More Light."

U. S. GUTTA PERCHA PAINT CO.
Factory and Main Offices
31 DUDLEY ST. PROVIDENCE, R. I.
New York—350 Madison Ave.
Chicago—659 Washington Blvd.
San Francisco—38 O'Farrell Street
And 100 other distributing points in U. S. A.

The board on the right was painted with a high grade flat-finish paint—that on the left with Barreled Sunlight. Both received an equal amount of "handling." At the end of a week—notice the difference!



Left—refined linseed oil such as is used in the highest quality oil paints. It is deep amber color. (Note the darkness of the photograph.)

Right—the same oil after being treated by the "Rice Process." It is almost colorless. This is one of the secrets of the lasting whiteness of Barreled Sunlight. (Reproduced from actual photographs.)

Barreled Sunlight

THE RICE PROCESS WHITE

The Uniflow Engine

L. C. ROVE
Sales Engineer Nordberg Manufacturing Co.

IT may be well to consider the sources of loss in any actual engine which make it less efficient than a theoretical engine.

These losses are caused, first, by cylinder condensation; second, by conduction and radiation; third, by leakage past the piston and valves; fourth, by friction of the moving parts; fifth, by defects in the valve gear and consequent inefficient steam distribution.

By far the most important of these losses is cylinder condensation.

In any engine using steam expansively, the steam, after cut-off, not only decreases in pressure with its increase in volume, but also decreases in temperature, so that the cylinder walls and pistons are cooled by the expanding steam as the piston travels through its stroke.

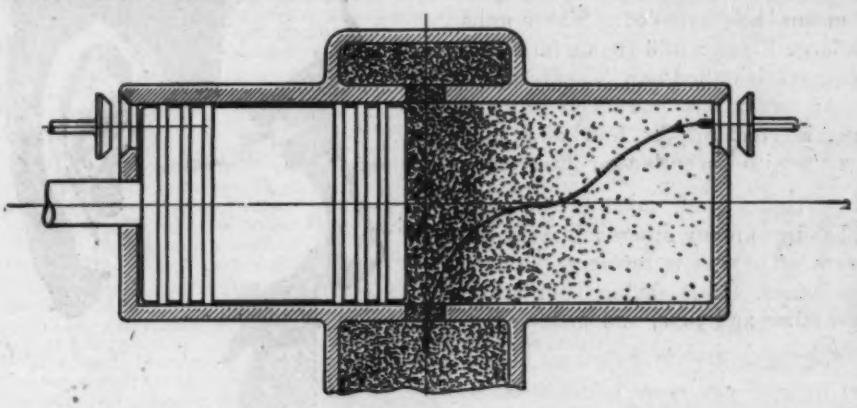


Fig. 1—Showing Uniflow Principle

In an ordinary counter-flow engine the face of the piston, the cylinder walls and the head are exposed to exhaust temperature during practically all of the exhaust stroke. The other face of the piston and other cylinder head are exposed on the next stroke, so that the entire internal surfaces of the cylinder are exposed to exhaust temperature 50 per cent or more of the time.

When the steam valve opens the hot steam meets these large cold surfaces and "initial condensation" takes place. This loss in steam for useful work is far greater than all the other losses combined. Therefore, any change in the design of an engine which will materially cut down cylinder condensation becomes most important.

The principle of the uniflow engine is illustrated diagrammatically by Fig. 1. The engine has two steam valves, one at each end of the cylinder, for the admission of steam. There are no exhaust valves in a true uniflow engine, but, instead, exhaust ports are placed in the center of the cylinder. The piston is made long, practically 9/10 of the stroke, and the cylinder is practically twice the length of the stroke.

It will be seen that the steam enters at one end of the cylinder and flows in one general direction to the central exhaust port, which is uncovered by the piston near the end of its travel and then covered again very early in the return stroke.

On the return stroke the steam at exhaust temperature and pressure is caught between the piston and cylinder head, and as the piston moves back this steam is compressed, so that at the end of the stroke the pressure of the clearance space is equal to the steam line pressure. The temperature is also increased due to compression, so that at the next admission of steam the cylinder head and piston are very hot and initial condensation is eliminated.

Uniflow Engine Not New Idea

Contrary to the general impression, the basic idea of the uniflow engine is not a recent invention. As far back as 1867 John M. Hirlinger was granted a patent which really embodied the uniflow idea, but it was not until 1885 that Leonard Todd, an Englishman, was granted a British patent on a true uniflow engine.

Nothing, however, was done in a practical way with the uniflow principle until about twelve years ago, when Mr. Nordberg and Prof. Stumpf independently of each other began the development of this type of engine.

The first uniflow engine in this country was built by the

Fig. 2—Nordberg's first Uniflow engine, fitted with Corliss valves. (First successful uniflow built in the United States)

When a Customer Reorders

It means he's satisfied. Six months ago a large Eastern mill (name furnished on request) installed two Niagara Beaters. An order has just been received from this concern, for four additional Niagaras, with an option on three more.

The Niagara made good in this mill, as it has in so many others and as it will in yours. There it is replacing Holland type engines. It is saving floor space, power, labor and time, and making better stock.

Let us give you more information regarding the cost cutting abilities of Niagara Beaters. Write today.

Valley Iron Works Co.

Plant, Appleton, Wis.

New York Office, 350 Madison Ave.

Nordberg Mfg. Co. about twelve years ago. It was equipped with Corliss steam valves and central exhaust ports. This engine was erected in the Nordberg shops and was tested out for about two years, in all about 150 tests being conducted, from which very valuable information was secured on the economies resulting from the uniflow principle under various conditions of initial and final pressures and at various loads. This particular engine was finally sold to the city of Cedarburg, Wis., and is still in service and giving excellent satisfaction.

Fig. 2 shows the first Nordberg uniflow engine built with Corliss inlet valves and the characteristic port in the center of the cylinder which is uncovered by the piston at the end of its stroke. A clearance pocket is provided in the head of this cylinder. This engine was built to run condensing with small clearance, and a relief valve works automatically in case the vacuum is lost and the compression pressure becomes too great and throws into communication the cylinder and clearance pocket. If it is necessary to continue running without the condenser a hand wheel is provided to open the valve for as long as it might be necessary to run non-condensing.

Up to this point we have considered only the true uniflow engine, that is an engine exhausting entirely through the central port in the cylinder and without auxiliary exhaust valves. This engine is suitable only for condensing conditions or to run non-condensing when the initial pressure is very high. Such an engine to run economically should be built with small clearance, and if the initial steam pressure should vary the compression will also change. This is also true if the pressure against which the engine is to exhaust be changed, so that the engine cannot perform correctly except within very rigid limits of initial and final pressures.

If the engine is exhausting into a condenser, even with small clearance, the compression line, with compression beginning very early, will still be below the initial pressure at the end of compression. But under non-condensing conditions or with a back pressure it is necessary to have a very large clearance in order that the compression line shall not go above the initial pressure at the end of compression.

It is, of course, desirable to have an engine of the uniflow type which will give good economy both condensing and non-condensing, and a number of methods have been devised for accomplishing this operation. One method is to increase the clearance for non-condensing work by substituting a different piston which will give larger or smaller clearance in the cylinder, but this of course would be a clumsy contrivance. Another method is to have an auxiliary clearance chamber which can be automatically connected to the normal clearance for non-condensing work.

However, the simplest and best method is by the use of exhaust valves, these valves to be inoperative for condensing operation and to be thrown into service for non-condensing work.

It would seem at first glance that this method involves a

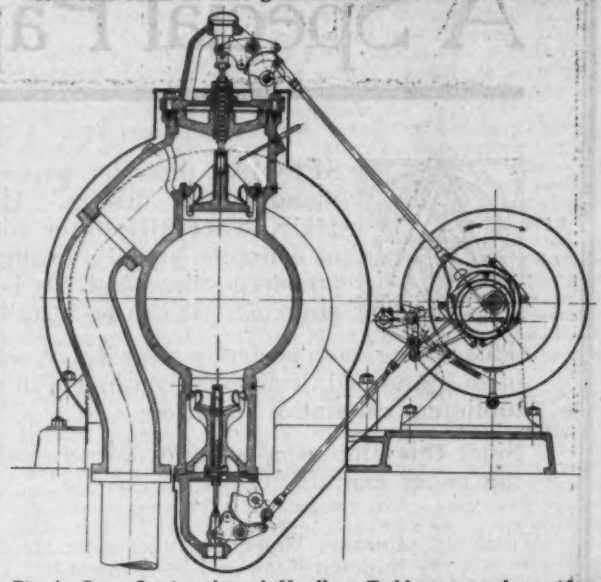


Fig. 4—Cross Section through Nordberg-Todd poppet valve uniflow cylinder

loss of the major part of the benefits derived from the uniflow principle, but calculation shows that between 70 and 80 per cent of the exhaust steam passes through the central exhaust port when running non-condensing, so that only a small quantity of the steam is exhausted through the exhaust valves, and the economy of a poppet valve uniflow engine, even when running non-condensing and with the auxiliary exhaust valves in partial operation, is considerably better than that which can be obtained in any four-valve counter-flow cylinder.

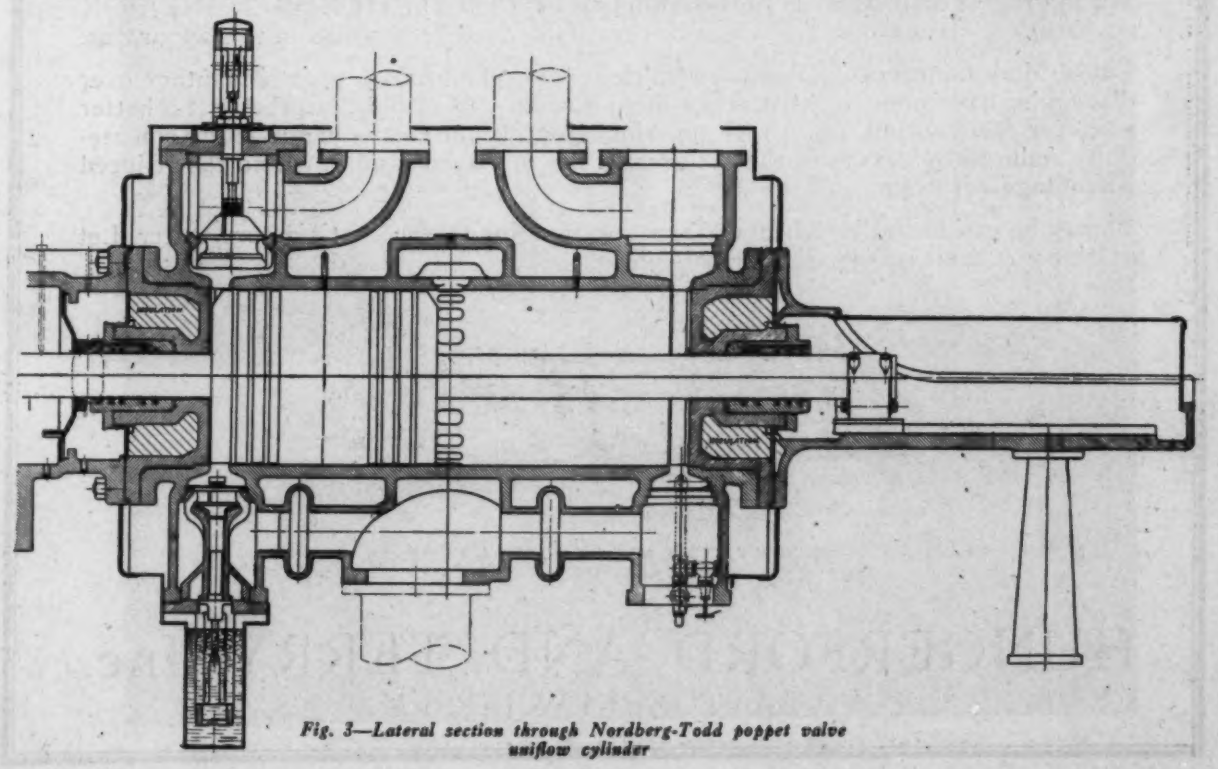


Fig. 3—Lateral section through Nordberg-Todd poppet valve uniflow cylinder

A Special Paper Mill Filter

A SPECIAL filter for paper mills, producing all the results the paper manufacturer desires. It is a modification of the well known HUNGERFORD filter adapted to paper mill use. It is constructed of concrete, strictly wrought iron pipe, brass strainers and especially prepared silica sand. It is as durable and efficient as can be built at any cost. It can be installed at a very low figure.

This filter gives a perfectly clear water, washes thoroughly, does not require renewal of the sand bed, is absolutely reliable in the performance of its duty and requires a minimum amount of attention.

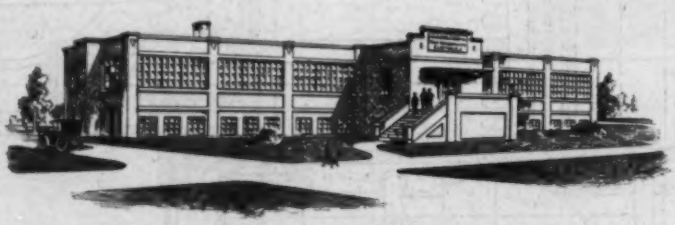
Since this filter was brought out two years ago it has been installed by the following paper manufacturers:

Burmus Paper Co	1,000,000 gallons per day
National Fibre and Insurance Co	3,000,000 gallons per day
Kimberly Clark Co	4,000,000 gallons per day
Cherry River Paper Co	4,000,000 gallons per day
Viscose Company	4,000,000 gallons per day
Racquette R. Paper Co	6,000,000 gallons per day

The HUNGERFORD Filter has been on the market for a period of over TWENTY years and installations are to be found in the largest Bleacheries, Woolen Mills, Silk Mills, Paper Mills, Dye Plants, etc., in the United States, Canada and England. The aggregate daily capacity of these filters is over EIGHT HUNDRED MILLION GALLONS. Hundreds of testimonials certify to the effectiveness of this apparatus.

Those Manufacturers who own an efficient filter plant have a great advantage over those who have none, or at best, an inefficient one. Not only can they get a better price for their output, due to its superior color, but the cost of manufacture is materially reduced by reason of the far greater life of screens and felts and the reduced percentage of broke.

It may be easier and far cheaper than you imagine to get a satisfactory water. Let us give you some information on this point.



THE NEW FACTORY OF HUNGERFORD & TERRY, INC.
AT CLAYTON, N. J.

HUNGERFORD AND TERRY, Inc.

CLAYTON, NEW JERSEY

Fig. 3 shows a lateral section through a modern Nordberg-Todd poppet valve uniflow cylinder. You will note this cylinder is equipped with both inlet and exhaust valves. These valves are located in the cylinder in separate removable cages made of the same metal as the valves, so that the coefficent of expansion is always the same. The cylinder proper is circular in cross-section, with an exhaust belt in the center.

Fig. 4 shows a cross-section of the same cylinder through

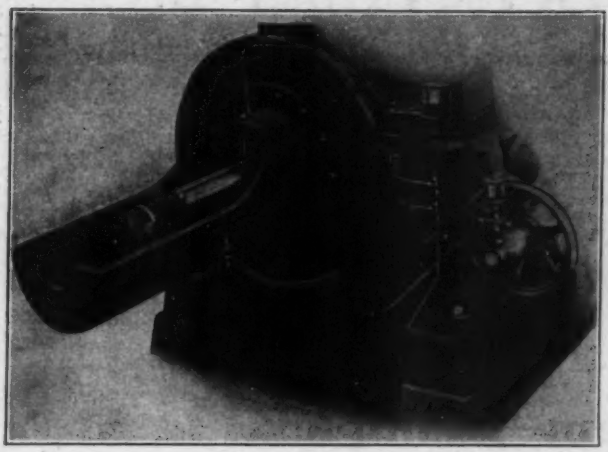


Fig. 5—View showing tail rod and tail guide of Nordberg uniflow engine

the valves and also shows the valve gear. You will note the valves are driven by a double cam in contact with two rollers, so that no springs are necessary to close the valves or to keep the rollers in contact with the surface of the cam. This is very important, as the motion of the valves is very rapid and the reaction of heavy springs transmitted through the steam eccentrics would not only tend to wear the parts but to interfere with the fineness of regulation. You will also note that the exhaust eccentric rod is so arranged that it can be lengthened or shortened while the engine is running by merely shifting a small hand lever. By changing the length of the exhaust eccentric rod the position of the exhaust cam is changed so that when running condensing the motion of the cam does not open the exhaust valve at all, but by shifting the lever the exhaust valve may be opened and kept open to any desired point of exhaust closure when running non-condensing.

Operates Under Any Desired Back Pressure

With this device the engine not only can be shifted from condensing to non-condensing conditions while it is running, but the exhaust valves can be so controlled that the engine will operate under any desired back pressure.

All the joints of the valve cages and the bonnets are ground so that no gaskets are used. The valve stem passes through a removable guide which is accurately reamed to size. The stem contains a series of grooves forming labyrinth packing and the stem itself is accurately ground and then lapped until it is about 2/1000 of an inch smaller in diameter than the guide through which it passes. Other guides are provided in the bonnet and in the cage at each end of the valve stem, so that it must move in a perfectly true up-an-down direction, so that when properly assembled it will move through the central guide without coming into contact with it and with a clearance on each side of about 1/1000 of an inch. Under these conditions the labyrinth packing is absolutely steam tight, is frictionless and will stay tight indefinitely.

A properly proportioned steam-tight valve is one of the most important features in the design of any engine. Most uniflow engines are equipped with poppet type of valve, but the Nordberg Mfg. Co. is the only concern in this country who has succeeded in getting a properly constructed valve and one that stays tight. This valve is a one-piece double beat balanced valve, carefully ground to a seat in its removable cage. The advantages of removable cages are obvious. The valves and cages are cast at the same time from the same heat and consequently have the same coefficient of expansion. The valve is so designed that the distance between the two seating surfaces is always the same in the valve and cage no matter what the temperature of the surrounding steam may be. Many years before the first uniflow engine was built in this country Mr. Nordberg designed and built a great number of poppet valve engines of the slow-running releasing gear type, but with valves of the same construction as the

Fig. 6—Installation for Chas. Boldt Paper Mills

RAG CUTTERS

Single—Tandem—Multiplex

In Capacities from 1,500 lbs. to 10,000 lbs. per Hour

Pulp Shredders Disc Choppers

Little "Giant" Paper Shredders

Whatever You Cut, A GIANT Will Solve Your Problem

Roll Bars Rag Cutter Knives Bed Plates

TAYLOR, STILES & COMPANY

RIEGELSVILLE, N. J., U. S. A.

Waterous Engine Works Company, Ltd.
Brantford, Ontario, Canada
Canadian Representatives

R. J. Marx
133-139 Finsbury Pavement, London, E. C.
Sole Agents for Europe

balanced poppet valves in the modern Nordberg uniflow engine.

A number of poppet valve engines are on the market having a two-piece valve, the upper and lower faces being flexibly connected in an effort to eliminate leakage. The use of this type of valve is an admission that the manufacturer cannot make a one-piece valve which will stay tight, and the additional joints both at the center and periphery of a two-piece valve are of course sure to leak steam sooner or later.

Some time ago the Navy Department decided to equip a marine steam engine with poppet valves as an experiment, and of all the available designs of poppet valve the Nordberg type was selected as the best.

Fig. 5 shows the tail rod and tail guide of the engine, which is a very important feature. The piston rod is made very large in diameter to resist deflection so that the piston is supported at each end of the piston rod, sliding on the babbitted shoe of the crosshead at one end and the tail rod shoes at the other end, so that the piston floats in the cylinder and its friction and wear reduced to a minimum. The hand wheel shown in this view on the end of the lay shaft is used to synchronize the engine when driving alternating current generators in parallel. Turning this wheel increases or decreases the tension on the governor springs so that the speed of the engine may be changed slightly in either direction.

Fig. 6 is a picture of a 24"x36" Nordberg uniflow engine direct connected to an alternator at the Charles Boldt Paper Mills Co., Cincinnati, O., now owned by the Chicago Mill & Lumber Co. The Charles Boldt Paper Mills Co. has since installed a duplicate of this unit at their new mill at New Iberia, La.

No Engine Theoretically Perfect

In closing it will perhaps be well to review the important features of the uniflow engine and to note its superiority over other types when properly designed and constructed.

No engine can be theoretically perfect, that is, no engine can convert all of the heat in the steam into useful work, but a well designed and carefully made uniflow engine may outstrip most of the counter-flow engines in approaching perfection.

In the beginning it was stated that the losses in any engine are caused first, by cylinder condensation; second, by conduction and radiation; third, by leakage past the piston and valves; fourth, by defects in the valve gear and consequent inefficient steam distribution, and fifth, by the friction of the moving parts.

We have already examined the first and most important of these losses, namely, cylinder condensation, and have shown how it is possible by utilizing the uniflow principle to cut out initial condensation and greatly reduce the total cylinder condensation. Furthermore, by the employment of poppet valves the steam used in the engine may be highly superheated without encountering any operating troubles, so that cylinder condensation may be entirely eliminated if the steam is sufficiently superheated before entering the engine.

Second, the conduction and radiation losses are a function of time, so that by efficiently covering the cylinder and heads with good non-conducting material and running the engine at high piston speed these losses may be reduced to a minimum. Nordberg uniflow engines are designed to run at piston speeds from 800′ to 1,000′ per minute.

Third, the loss of steam by leakage through balanced poppet valves is zero, while the leakage past valves of other types is considerable, varying from comparatively a small quantity up to 5 or 6 per cent, even in engines that are supposed to be in good condition.

Fourth, the steam distribution depending upon the design and construction of the valve gear plays an important part in the efficiency of any steam engine. The valves must not only be large enough, but must open and close quickly enough so that there shall be no drop in the steam line of the indicator card and so that the point of cut-off shall be well defined and not rounded on the indicator diagram.

You will note the Nordberg valve gear is operated by a lay shaft driven by cut beveled gears that run in oil. The eccentrics which drive the valve gear cams reach up from this lay shaft to the valve bonnets, and the expansion and contraction laterally of the cylinder does not in any way affect the valve setting.

The cylinder of a medium-size uniflow engine will expand about 3/16", depending upon the temperature of the working steam. It will therefore be seen than any valve gear which is driven from the main shaft by an eccentric, the rod of which is not subjected to heat, will be distorted as soon as the cylinder is heated by the steam and will continually change one way or another for any variation in steam pressure and superheat which will make the cylinder expand or contract in length. It is true that a uniflow engine driven by eccentrics usually has some method of adjusting the valve gear after the cylinder is hot, but this is a crude makeshift and has generally been abandoned in European practice long ago in favor of the lay shaft.

I have just reviewed the several features in principle and design of the uniflow engine which go to make it highly efficient. But the most pronounced characteristic of this engine is its remarkably flat steam consumption curve.

Heat Treated Steel Is the Best*

By W. F. EBBING
Secretary of The Ohio Knife Company

THE subject of the good and correct manufacture of beater roll fly bars and bed plates is an important one, yet very little understood or appreciated.

I will not attempt to dwell on the question of which type of beaters, or fly bars, or bed plates is best for certain kinds of paper, or board, as I am not a papermaker, and will only try to tell you our side of it.

The manufacture of fly bars begins properly with the manufacture of raw materials. Laboratory samples taken at random from shipments are analyzed, and tested for ingredient contents, carbon, alloys, hardness and surface defects such as seams and decarbonization and internal defects.

The methods of manufacture vary according to sizes and materials, like the making of paper which properly begins with the raw materials in the beaters. Often it is said that it is in the beater where paper in made, and as a result stricter attention has been given to the beater, and what goes to make up the beater?—fly bars and bed plates.

Ninety-five per cent or more of fly bars and bed plates are made of steel. Years ago these were of high carbon tool steel welded to a soft steel back, or what is called "Laid Bars," the idea being to maintain a square edge on the roll bars and the steel filling of the bed plate. Then the idea was conceived that on the cheaper and rough grades of paper, and paper board, that the beater, fly bars and bed plates were not so essential, so in that class of paper the cheapest kind of steel bars were used. The error of this was short lived. Then came the "O. K. Soft Center Fly Bar."

The "O. K. Soft Center Fly Bar" is hardened and tempered. Both flat sides are hardened and tempered bone hard about 2½ inches back from the cutting edge, the back part of the bar being left in the natural or soft state, permits the bar to bend back considerably before breaking should some foreign substance such as iron get into the beater. The center of the thickness also being left soft—that is between the hard flat sides—wears away first, leaving duplex hard edges wihch will not burr over, or wear rounding, but continue to stay sharp during the life of the bar, and the life of the bar is lengthened because of the special heat treatment, also because a tempered knife will wear longer than an untempered one, or any steel fly bars, and steel for use in bed plates.

Square edge fly bars require less power than bars whose edges become burred as is done on steel not heat treated.

You will note I referred to the heat treated steel bars as "O. K. Soft Center." This brand was applied because of The Ohio Knife Co. being the pioneers in heat treating steel steel fly bars, and steel for use in bed plates.

*Paper read before the board division of the American Pulp and Paper Mill Superintendents Association held in Chicago, February 10.

For the past few years another type of steel has been brought out which is known as special Alloy Steel, or Vanadium Alloy Steel. The difficulty here, however, is the non-uniform ingredient contents. Considerable of this trouble is overcome by heat treating, so that it is well to insist on heat treated steel whether the bars are to be made of open hearth steel, or an alloy steel.

Bed Plates

When you get from the manufacturer a bed plate of whatever style or design it may be, each bar of steel in that plate shows a square edge, whether the wood is as high as steel or below the edges of the steel. When, there is used a soft steel not heat treated, these untreated steel bars burr, the edge of steel being as an illustration, ⅝ inch to ½ inch or more thick, when originally it was but 3/16 inch or ¼ inch thick, literally covering the wood filling so that as the plate becomes smoother and smoother it becomes nearer to impossible to beat off the stuff. To get the plate to its original efficiency you have to chip the steel or the burred part; and bring it back, so the wood will show as it should.

Steel, of whatever nature of structure should be heat treated, and that heat treatment to vary according to ingredient contents and the work it is to do. The manufacturer that does

*Paper read before the Board division of the American Pulp and Paper Mill Superintendents Association held in Chicago February 10.

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There is much that can be said in favor of heat treated steel, and none against it, not even a high first or initial cost. Proper heat treating of steel increases the tensile strength and wearing quality from 30 per cent to 100 per cent and even more, according to the structure of the steel, the ingredient contents, and equipment for the control of the high heats necessary. The control of heats whether that of forging, hardening or tempering is essential.

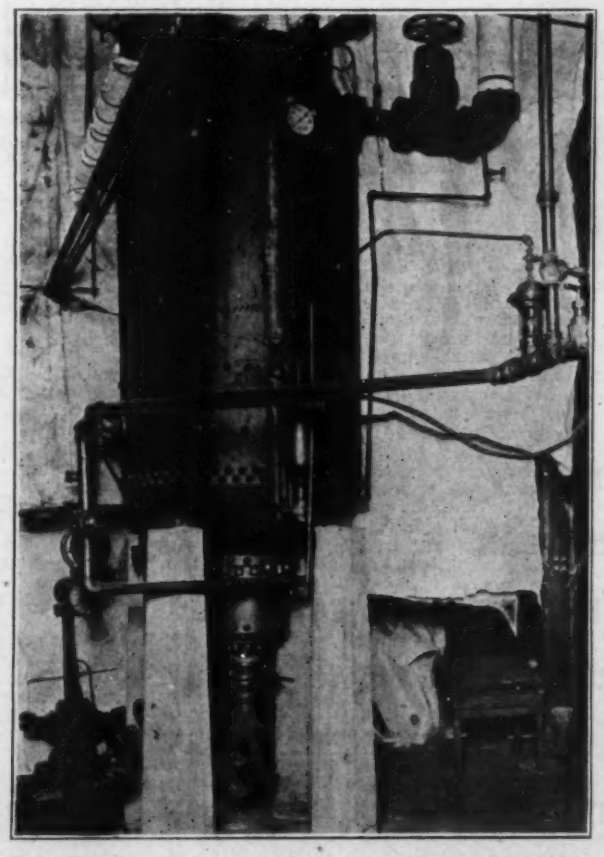
The power consumption of beaters varies, and economy of power depends on many factors, such as the design and construction of the beater, the kind of stock used, the grade of board to be made, etc., but is not one of the principal factors the condition of the fly bars and bed plates? I think it is. Good straight fly bars, evenly spaced, square on the cutting edges of both the fly bars and the steel in your bed plate constitute a big power saver, and a quick producer. This condition can be more easily maintained by the use of proper heat treated steel.

The Electric Steam Generator

By E. H. HORSTKOTTE
Power & Mining Engineering Dept., General Electric Co.

DURING this winter and probably for some time afterwards, fuel economy and existence are going to be synonymous terms for the industries of this country. Therefore particular interest attaches to any means of generation power, especially necessary steam, for heating or process work, that will materially cut the consumption of coal or fuel oil.

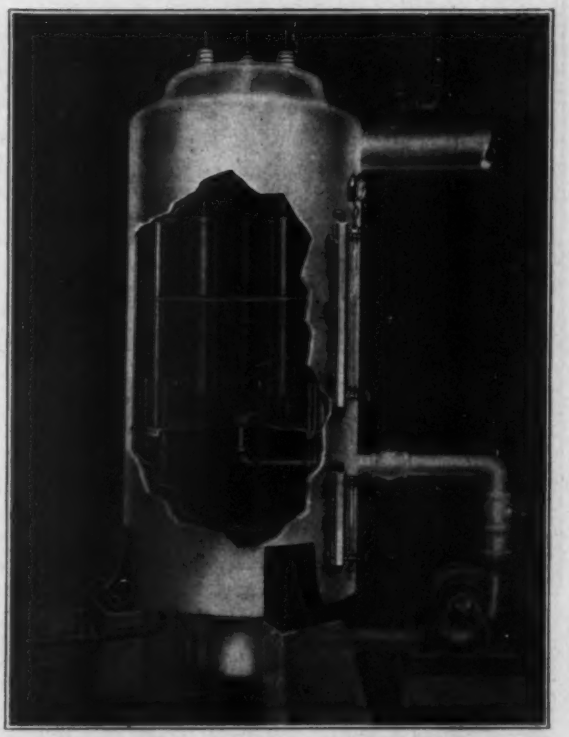
Such a means has arisen in the electric steam generator, which has already demonstrated its value in certain industries, and whose field in this line of service is enormous. Central stations both in the United States and Canada have already found the steam generator a splendid means of utilizing excess power. Pulp and paper mills in both countries



are using it for "ironing out" their load curves, and for using surplus energy to produce necessary process and heating steam.

After considerable investigation, covering the study of all existing types, the General Electric Company has designed an electric steam generator, in which first consideration has been given to the three great requirements of its service, simplicity, safety and reliability. The equipment as installed may be said to form a complete steam generating plant which is capable of operating with minimum attendance, is compact, and easy to install. It requires power at the approximate rate of 10 KW for every boiler HP of steam generated.

The complete equipment consists of the shell with supporting feet, the electrodes, insulators, steam and water gauges, safety valve, circulating pump and motor, and a panel in which is mounted the control equipment.



The tank, or generator shell, is mounted vertically, and divided horizontally into two compartments, the upper known as the electrode compartment, where the actual generation of steam takes place, and the lower forming a self-contained hot well. Water entering the hot well from the feed water pipe is forced into the upper chamber by the motor driven centrifugal pump located on a short external pipe line. From this chamber it flows back into the hot well through a number of small holes on the outer circumference of the dividing plate. This arrangement provides a continual circulation of heated water, the water level in the electrode chamber being held at the desired level by setting the valve in the circulating pump discharge line.

The upper, or electrode chamber, where the steam is generated, contains three large round iron electrodes rigidly supported from the roof, the current carrying supporting rods coming in through specially designed insulating bushings. These bushings are provided with a small duct in the top leading to the outside air. Thus if steam does succeed in leaking through the packing into the upper section of the bushing, it passes out freely instead of creating a pressure that might blow out the side of the insulator.

The electrical operation somewhat resembles that of a three-phase arc furnace. Normally the electrodes are submerged in the water, and the three-phase current passes through the water to the sides of the tank, or from electrode to electrode. The steam is generated by current flowing through the water, which is of high resistance. The mechanical circulation of the water has been described, but some of the operating features arising from it are of sufficient interest to merit further description. One result is that the temperature of all the water in the system is practically uniform. If the steam pressure lowers due to an increased demand, rapid steam generation due to the high temperature of the water, and the degree to which the electrodes are submerged, quickly brings the pressure up again.

Another operating feature is that since the water level

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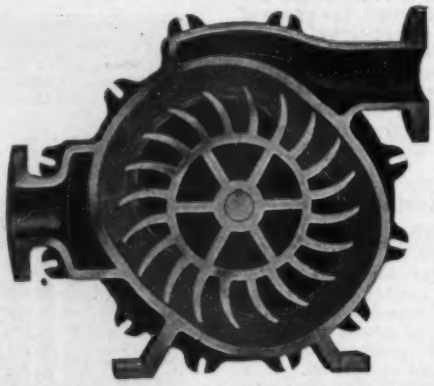

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is maintained by the adjustment of the throttle of the circulating pump, the energy consumption of the generator is not dependent on the operation of the feed water pump. The supply of water in the hot well is regulated by an automatic feed water regulator. Furthermore, when it is desired to reduce the load, the generator does not have to be blown, which means that water does not have to be pumped in subsequently against full pressure. The only energy losses in the circulating pump are the motor losses and the pump and bearing friction losses, therefore all energy delivered to the pump eventually goes into heat in the water, and there is no wastage.

The control equipment consists of an incoming line panel carrying automatic circuit breakers, the necessary meters and instrument transformers and the control apparatus for the circulating pump. Since the kilowatt capacity of these boilers is comparatively large, the devices used on the board are of the same heavy construction and have the same current carrying and rupturing capacity as those used in substations, and heavy feeder circuits, tie lines, etc., for similar duty.

Of vital importance in this, as in all apparatus for the production of steam, is the safety factor. For several reasons, soon explained, it may be said that the safety factor of the steam generator is even greater than that of the average boiler, highly developed as the latter is. The safety valve takes care of excess pressure, as on the standard variety of boiler, and the method of protecting the insulators has been described. Further contingencies are taken care of by what may be described as the interlocking of the various controls. Suppose, for example, the circulating pump ceases to function, from voltage failure or other cause. The water in the electrode chamber simply drains into the hot well, and, since the electrodes are no longer submerged, no more steam is generated. Also, on resumption of the pumping, since there is no hot metal surface in the electrode furnace, there is no danger of an explosion similar to that due to a hot crown sheet in a boiler. Also when the water drains out, there is no danger of burning any part of the electrode chamber because when there is no water there is no heat generated. Too high a level of the water is prevented by an emergency drain of large diameter whose top is some distance from the top of the electrode chamber.

A consideration of the steam supply problems of industrial plants has disclosed many cases where the steam generator would prove a valuable adjunct to the plant equipment, either in utilizing excess electric power formerly wasted, or in providing process steam directly where it is needed. In the case of paper mills there are at least fifty-nine days in the year when the plant is idle, yet a supply of steam must be maintained for various purposes. In textile mills steam is necessary, especially at night, to heat the plant, when the motors are not running, or on Sundays and holidays for the same purpose. Ordinarily this means, in both cases, that a certain amount of steam must be kept up in the boilers and that, in addition to the fuel, necessitates the presence of firemen and engineers over the idle period. Should an electric steam generator be installed, it would operate practically without attendance, except for a cursory inspection by a watchman, and its use would permit the banking of the fires if coal were used, or the shutting down of oil-fired boilers when the plant was idle.

The economy effected in such instances is too obvious to require comment.

Many mills purchase power on a maximum demand basis, and here the savings effected by the steam generator are just as tangible, but arise from a different cause. Suppose, for example, a factory contracts for 10,000 KW maximum demand. It is perfectly possible that, owing to one cause or another, the load factor for the year may be as low as 75%. In such a case 2,500 KW years, or 21,900,000 KW are being paid for but not used. By installing an electric steam generator to utilize this energy, the fuel bills would be cut materially.

New Type of Variable Speed Engine

A new development in engines for use in paper mills is the application of the uniflow type of engine to variable speed uses. As far as we know the first application along these lines was made by the Harrisburg Foundry and Machine Works, Harrisburg, Pa. They have recently made an installation in the plant of the Kieckhefer Container Company, Delair, N. J. The equipment consists of two 15x18 Harrisburg Dual Clearance Uniflow engines connected to one shaft, as will be seen from the accompanying illustration. The wheel is 66" diameter by 28" face. The variable speed is obtained by means of a Moore and White Speed Changer. The engine is designed for 190 pounds I.S.P. with a maximum back pressure of 20 pounds to operate at a maximum speed of 220 r.p.m. and when operating under these conditions to develop 300 I.H.P.

The following brief explanation of the principle of this new engine is from a descriptive bulletin recently published by the manufacturers:

"The Uniflow engine, where compression commences, shortly after the beginning of the return stroke, when operating non-condensing requires enormous volumetric clearances to prevent the pressure of compression rising to a dangerous point. To avoid this excessive compression, a volumetric clearance of from 20 to 30 per cent of the piston displacement must be provided, with usual steam conditions, to result in proper operation.

"As large clearances are not conducive to economy, various efforts have been made in the non-condensing Uniflow engine to accomplish the benefits of small clearances and at the same time conserve the gains resulting from the use of the Uniflow

principle. To this end some builders resort to the use of auxiliary exhaust valves, which, while allowing the use of small clearances, defeat the principle on which the economy of the Uniflow engine depends.

"In the Harrisburg Dual Clearance engine the steam is expanded from a small clearance and, by the automatic action of the single valve, is allowed to compress, first, into a large chamber, and finally, as the piston nears the end of the stroke, into a small clearance. The steam which has been compressed in the large chamber enters, by the automatic action of the valve, the cylinder at the opposite end and, mixing with the expanding steam on the return stroke, expands with it and passes out the central ports to the exhaust."

Application of Steam Traps to Paper Machine Dryers

By L. D. GOFF

Armstrong Machine Works, Three Rivers, Mich.

TO insure the best of satisfaction, a steam trap installed on paper machine dryers should be protected by an efficient separator which will not only deliver dry steam to the paper machine but will remove a considerable portion of the oil and sediment usually carried by exhaust steam. Although the type of trap described here has the ability to handle quantities of oil, grease and sediment which would prove fatal to other types of traps, yet it has certain limitations, and for this reason the installation of an efficient separator is always recommended.

To meet a demand for an economical and efficient drainage system for paper machine dryers, where the temperatures

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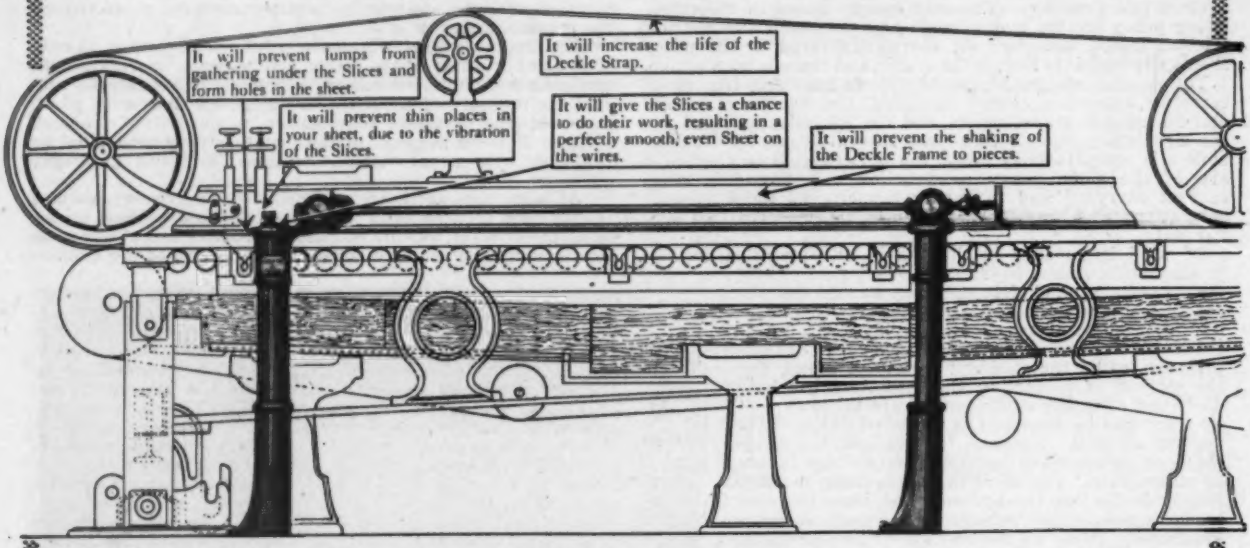
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carried on the machine may be easily and accurately controlled, where maximum efficiency is desired, an installation is suggested using steam traps in connection with a vacuum pump as shown on the diagram. The operation of this is as follows:

The illustration shows merely a diagrammatic sketch of sixteen dryers on a paper machine. The method of draining paper machine dryers may be applied to any paper machine regardless of the number of dryers.

The piping arrangement is so planned that the machine may be divided into any number of sections and different temperatures carried on each section. Three or four dryers on the wet end of the machine are connected to be used as condensers, the main steam header is divided at the dry end of the machine by a valve (F) that high pressure steam may be carried on a predetermined number of dryers. All dryers are drained with traps, and all but those used as condensers discharge into the main drip header (D). All dryers, with the exception of those used as condensers, are supplied through the main steam header (B), this being divided at the dry end as mentioned above so that a higher pressure may be carried on the dry end section of the supply header (C), than is carried on the balance of the header.

The supply to the dryers, which operate as condensers, is so arranged that steam may be supplied from the main supply header or three dryers may draw the steam from the main drip deader. The discharge of the traps draining these dryers goes to the pump header (E) which is drained by the vacuum pump and on which any desired vacuum may be maintained. The main drip header is drained by a large trap which discharges into the pump header.

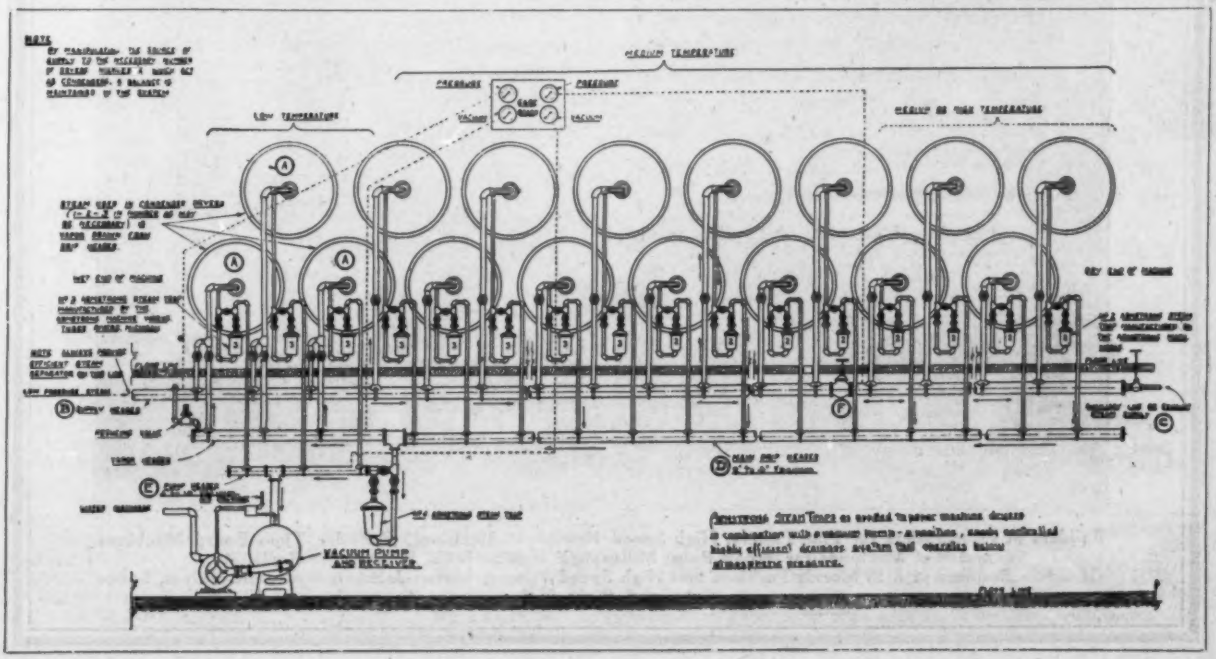
In operation we will assume that three temperatures are desired on the machine. The high temperature being maintained by the use of live steam at, say, 5 lbs. pressure, and that exhaust steam at 2 lbs. pressure is being used in the center section of the dryers. As before stated, the traps draining all of the dryers, excepting those acting as condensers, discharge into the main drip header. The condenser dryers draw flash or vapor from the main drip header, this vapor being the result of water at 2 and 5 lbs. pressure being discharged by the traps draining the center and dry end section of dryers. In drawing steam from the main drip header the condenser dryers create a vacuum on the main drip header of, we will say, 4 inches. This is possible as we will maintain a vacuum on the pump header by means of the vacuum pump of from 6 to 8 inches or higher than the vacuum maintained on the main drip header. The condenser dryers which are creating a vacuum of 4 inches discharge into the pump header on which there is a higher vacuum.

It will be apparent then, that a vacuum is maintained on all drip headers into which the traps draining the paper machine dryers discharge. Because of this, it is possible to operate the machine at very low pressure, this, of course, depending on the drying capacity. With the arrangement of the supply piping to the dryers operating as condensers, it is possible to operate with one or two or all of them as condensers as may be desired. The installation of a reducing valve is suggested which will take steam from the main steam header and supply it to the main drip header, this valve to function when the vacuum in the main drip header runs above a predetermined point. In this manner it is possible to use three or more dryers as condensers and assure their operation at any desired temperature. By drawing vapor from the main drip header to the condenser dryers, we utilize the heat which otherwise must be reduced with cold water in order that the vacuum pump will function.

Where it is desirable to carry two or three different temperatures on a machine, the advantages of this system are quite apparent. There are other advantages such as the utilization of all of the heat of the steam, eliminating the use of cooling water at the vacuum pump, the insurance of each dryer operating at maximum efficiency because of its being really handled as a separator unit and there is a simplicity of circulation which is not unlike that of an ordinary steam heating system where there is a trap on each individual radiator, which has been one of the most successful systems.

There are other advantages. Providing the machine has sufficient drying capacity, it is possible to operate at a very low steam pressure because of the vacuum maintained on the drip and drain headers. This vacuum is not maintained by pumps, but by the condensing action of the wet end dryers which automatically reduce the temperature of these dryers lower than that carried on the balance of the machine, giving the desired advantage of starting the paper over cool dryers and bringing it up to drying temperature gradually. With this installation it is possible to quickly make adjustments and vary the temperatures as may be desired to suit the stock being dried; also adjustments can be quickly made to carry one temperature on the machine or different temperatures on the different sections. The complete system is so arranged that equally good results may be obtained when drying different grades of paper, in other words it will give high efficiency under variable conditions.

The Armstrong Trap, used to illustrate this application, is particularly suited to this service because the trap will not become air-bound, but instead will pass air on through to the discharge header without a waste of steam. It is also very efficient in the drainage of a paper machine dryer by syphon pipes as steam must continually flow to the trap in order that it remain closed; the moment water seals the syphon pipe, preventing this flow of steam, the steam in the bucket of the trap will condense and the bucket will sink opening the valve, when the discharge takes place. By the use of a trap on each dryer any difficulties due to the short-circuiting of the flow of steam through any section of the



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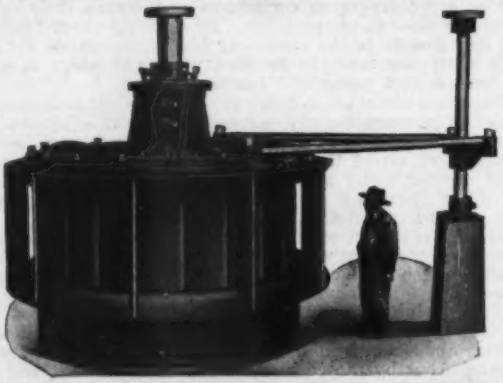

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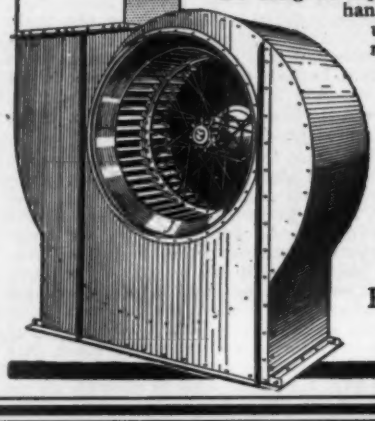

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(M-82)

dryers are eliminated. Each dryer operates as an individual unit entirely independent of any other dryer in the machine.

The recent development of a thermic unit to be used in connection with traps of this type is another valuable improvement. This unit when applied for draining paper machine dryers holds the trap open so long as it is cold, but immediately releases the trap when it is up to operating temperature. By use of this unit the machine heats up very rapidly when the steam is first turned on, all of the traps blowing straight through and cold air and water are discharged without interference. But when steam comes to the trap it immediately starts to function as a trap, preventing any discharge of steam, the same as though the trap were not equipped with a thermic unit.

Fox River Valley

Green Bay, Wis., March 1, 1923.

Wisconsin Laws Burden Industries

Radical taxation laws proposed by the Wisconsin legislature and which have every appearance of being put on the statute books are likely to result in changes in the paper manufacturing industry of widespread importance. At a meeting before the legislative committees considering tax bills last week paper manufacturers were among the 72 large corporations appearing and serving notice that they would refuse to go ahead with expansions if Wisconsin law makers went through with their plans for putting excessive burdens on business. Strong hints that some companies might even withdraw from the state are given considerable credance. Not only paper mills but manufacturing plants interested in the making of equipment and machinery installed in the mills are among those that would be hard hit and are threatening reprisals.

Among the companies which served notice they would not go ahead with contemplated building and expansion programs if the legislature did not change its policy toward industry were the following:

Beloit Iron Works, Beloit, one of the largest concerns in the world making paper mill machinery.

Valley Iron Works, Appleton, manufacturers of machinery and equipment used in paper mills.

Marinette and Menominee Paper Company, Oconto, manufacturers of paper.

On Thursday, March 1, came the announcement that the Green Bay Foundry and Machine Works had under consideration the removal of its plant to Menominee, Mich. This company is the maker of the North Save-all filters and other paper mill equipment. General Manager R. A. North said his concern had under consideration a building program that would double the plant's output, but that instead of going ahead with it, sites are being considered in Michigan, especially Menominee, and the factory may be removed from Wisconsin.

Dr. Hugh P. Baker Talks at Meeting

Dr. Hugh P. Baker, executive secretary of the American Paper and Pulp association, addressed a meeting of Fox river Valley paper manufacturers at Neenah, on Tuesday, Feb. 27, following a luncheon at the Valley Inn. Many manufacturers attended the meeting.

The establishment of a paper division in the department of commerce was discussed by Dr. Baker and he told how this was brought about, for the promotion of export trade in paper, through co-operation of the association with Secretary Herbert Hoover.

The conference was devoted quite largely to what was being done for the paper industry all over the country. Dr. Baker described the work of the American Paper and Pulp association, citing among the unusual activities the following:

Organized a national campaign to bring out larger supplies of waste paper to be reworked into paper. The paper industry pays $50,000,000 for waste paper in a year and an equal amount was not saved.

Co-operation with publishers in an effort to obtain reduction of second class postal rates.

Devoted great attention to forestry in the realization that in the future of the forests lies the solution of the raw materials problem of the paper industry.

Dr. Baker spoke the following day at Appleton before the Rotary club and on March 1, he spoke before the Rotary club in Green Bay. In both of his Rotary addresses he discussed forestry. Dr. Baker is making a tour of the paper manufacturing centers and besides his schedule of addresses in the interest of forestry he is inspecting mills.

Nekoosa-Edwards Directors Authorize Changes

At the annual meeting of stockholders of the Nekoosa-Edwards Paper company, of Port Edwards, on Feb. 12 and the

Paper Machinery and Equipment at Old Hickory Powder Plant Now Released for Immediate Disposal

24—Mammoth Jr. Jordan Engines. Maker Noble & Wood Co. Shell 5′ 6″ long, with 10-inch inlet and 6-inch outlet. Capacity, 30 tons per 24 hours. Will run either direction at 350-375 R. P. M. Fitted with steel bar knives, block and oak fillers.

40—Welded Steel Digesters, Maker Continental Iron Works. Capacity, 1300 cubic feet. Inside diameter, 8 feet. Length overall, 27 feet. Working pressure, 110 lbs. per square inch. Tested 165 lbs. per square inch. Each digester complete with cast iron supporting ring, cast iron false bottom, hoppers, guides, and all accessories.

200—Wood tanks new and used.

SIZE	CAPACITY
12 ft. 6 in. x 11 ft.	15,150 gal.
12 ft. 6 in. x 18 ft.	16,680 gal.

1500—Steel Tanks—capacities, 100 to 55,000 gallons.

Let us submit complete specifications and quote prices that will save you money.

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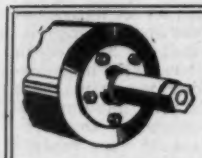

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Standardized Blue Prints

RODNEY HUNT

Registered Rolls

A Construction for Every Service

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The Smallwood-Low Stone Co.

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WARREN IMPROVED CALENDER DOCTORS

With Flexible Blades, Universal Adjustment and Control (PATENTED)

WARREN IMPROVED PATENT DOUBLE DRUM WINDERS

Patent BALL VALVE Hydrant

Stock Circulating Systems *and*

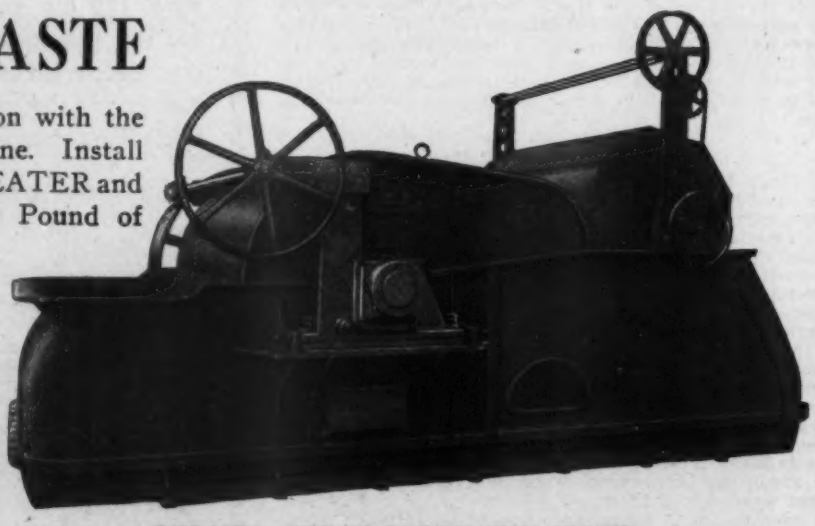
other Paper Mill Specialties

SEND FOR OUR BULLETIN

DON'T WASTE

Your Power by the Ton with the Ordinary Beating Engine. Install an UMPHERSTON BEATER and Save Power on Every Pound of Stock.

"We Build our Machinery to Meet Your Requirements"



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Information and Booklets describing our Specialties sent to you on request

HOLYOKE MACHINE COMPANY, Holyoke, Mass.

SOME OF THE "HOLYOKE" SPECIALTIES—Chilled Iron Rolls, Cotton Rolls, Paper Rolls, Wood Pulp Grinders, Wood Barkers, Wood Chippers, "Umpherston" Beaters, Rag and Paper Dusters, Washing and Beating Engines, Reeling Machines, Hydraulic Pumps, Hydraulic Presses, Coated Paper Strainers, Turbine Wheels, Gearing and Shafting, Calenders, Platers, Rag Cutters

meeting of directors immediately following, several important changes in the duties of officials were authorizd.

Lawrence Nash, manager of sales for nearly 25 years, was elevated to the position of vice president, but he will also retain his position as head of the sales department.

L. E. Smith, with the company 25 years in the handling of chemical pulp, both sulphite and sulphate, was promoted to be general superintendent over the mills producing chemical pulp. The office of this branch will be in Port Edwards where Mr. Smith will be in touch with the other department heads in manufacturing.

B. T. McBain, former director of manufacturing, has been made assistant general manager and will retain his old duties as director of manufacturing. C. A. Wiley will continue as assistant director of manufacturing under Mr. McBain.

Arrangements have been made by the company for the marketing of its new securities aggregating $3,000,000, four Wisconsin financial institutions having underwritten the issue. Only half of the issue goes on sale at this time. The concerns taking the bond issue are the Wood County National bank of Wisconsin Rapids. The First Wisconsin Trust company of Milwaukee. The First Trust company of Appleton and the Oshkosh Trust and Savings bank of Oshkosh. The proportion going to each has not been announced.

The $1,500,000 realized will supply all the capital needed for the improvements planned by the company and also will furnish funds for the retirement of outstanding bonds which fall due during the next five years.

After writing off large losses the Northern Paper mills of Green Bay have started with a clean slate and with every prospect of a most successful year, it was announced at the annual meeting early in February. Sales so far in 1923 are running far ahead of any previous year and the efficiency of the plant is such as to guarantee a profitable year, it was declared by Judson G. Rosebush, general manager, in his report to the stockholders. President W. P. Wagner presided at the meeting and reports were made by all department heads, a note of optimism running through each. The physical plant was said to have been greatly improved by alterations and rearrangements during the last year and the harmonious relations established with labor are expected to bear fruit in the coming year's report. The company has six machines running full time and recently added half a dozen young men to its sales department.

The Biron plant of the Consolidated Water Power and Paper Company, at Wisconsin Rapids, is to have a modern high speed news print machine installed this summer, it was announced recently by the company. It will be similar to the No. 4 machine at Wisconsin Rapids and will be built by the Beloit Iron Works. The company had considered placing this machine at Stevens Point. A two story brick building more than 400 feet long will have to be built to house the new machine which may trim as high as 150 inches. It will be built to operate at a speed of 800 feet a minute or better.

A modern, high speed news print machine, similar to the new No. 4 machine at the Wisconsin Rapids mill, and involving a total investment of several hundred thousand dollars, will be installed at the Biron division of the Consolidated Water Power and Paper Company this summer, it became known recently following the decision of the officers of the company to drop for the time being consideration of Stevens Point as the scene of expansion.

The Kimberly-Clark Company, Kimberly, Wis., expects to start work on a $30,000 club house and community building at Kimberly this spring. Directors of the company have authorized the expenditure of this amount and the mill council has given the project its approval. It is to be ready for occupation this fall. The company will provide a superintendent. A similar building at the company's plant at Niagara has proved a success.

The Westminster Paper Mills Limited of New Westminster, British Columbia, a company organized largely for men formerly identified with the Peshtigo Pulp and Paper company of Wisconsin, has shipped its first car of paper to Winnipeg.

S. A. Whedon, one of the founders of the Tuttle Press company, large manufacturers of crepe paper in Appleton, has disposed of the greater part of his interest to his partner, A. F. Tuttle and associates.

G. M. Hafenbrack, assistant employment manager of the Nekoosa-Edwards Paper Company, has resigned and will be connected with the Burroughs Adding Machine Company, at Tacoma, Wash.

HAMILTON ENGINES

24"x42" Hamilton Heavy-Duty Simple Corliss Engine installed in Hotel Pennsylvania, New York City

The Synonym of Dependability

HAMILTON engines are dependable. That is why they are a prudent investment. The cardinal requisite for all power equipment is just that—reliability.

Breakdowns for repairs are expensive, sometimes disastrous, and to HAMILTON users—unnecessary. HAMILTON engines guard against breakdown. Perfection of design and workmanship guarantee perfection of performance and of service and make them a synonym of dependability among prime movers.

The secret of HAMILTON dependability is threefold:

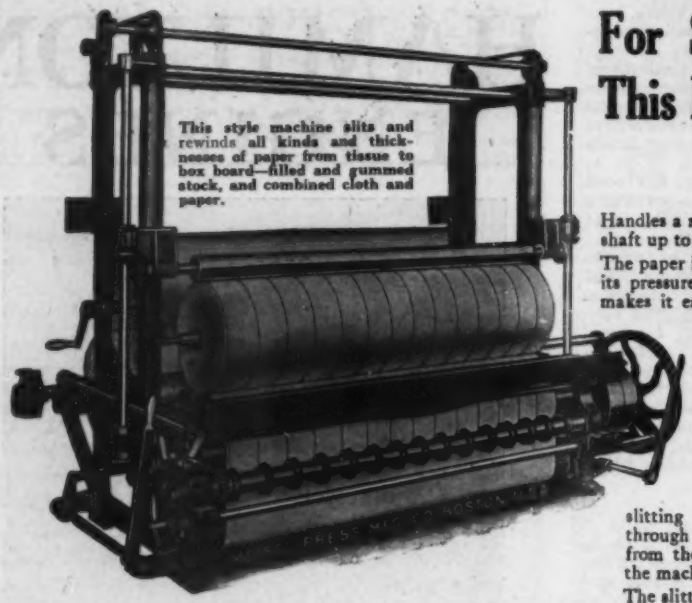
1. The design is correct and all parts are liberally proportioned to stand up under real heavy-duty service.
2. ***The basic metal must first be right.*** That is why our foundries with a daily capacity of 500 tons are chemically controlled. We know just what goes into HAMILTON castings and why.
3. Skilled workmen guard and check every step in their fabrication, through the machine shop to *the final assembled and tested unit.* They are made as good as it is possible to make them. Then they are packed right and shipped right.

The bulletins of HAMILTON engines give detailed description, fully illustrated, of all features of these dependable designs. If you have not received your copy on the particular type of engine you are interested in, a letter will bring it quickly to you.

The Hooven, Owens, Rentschler Co.

Hamilton Engines and Machinery

HAMILTON, OHIO



This style machine slits and rewinds all kinds and thicknesses of paper from tissue to box board—filled and gummed stock, and combined cloth and paper.

For Slitting and Rewinding This Is the BEST MACHINE Made

Handles a mill roll up to 40 inch diameter and rewinds on one shaft up to 40 inch in diameter.

The paper is rewound by the use of three rolls; the top roll by its pressure gives compactness to the rewound paper roll and makes it easy to handle the poorest grades of paper without breaking. That serious defect in some machines arising from a one-side drive for the top pressure roll is wholly overcome by our double drive which gives uniform bearing on the rewound roll. This top pressure roll is easily and quickly raised for changing the roll by turning a crank. Counterweights can be increased or decreased in weight according to requirements.

Another prominent feature of this machine is its convenience. It has a device for separating the slitting cutter shafts to facilitate threading the paper through the machine. All adjustments necessary are made from the operator's place which is at the rewinding end of the machine.

The slitting cutters which are on parallel shafts give a clean, shear cut. The cutters may be quickly adjusted to different widths from 1¼ inch upward, and are clamped to the shafts with ample bearing surface so that they always run perfectly true.

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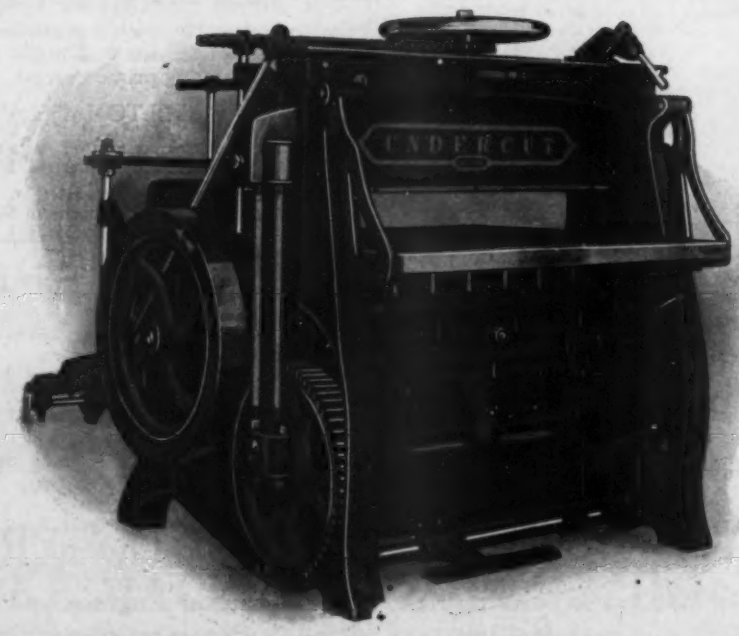
Paper Making Machinery

Unexcelled in Simplicity of Design Workmanship Accuracy and Safety

May we send you our New Cutter Bulletin 500-22



Paper Bag Making Machinery

Automatic Clamp and Power Back Gauge Starting and Stopping Device Two-Hand Throw in Lever

OUR 48-INCH HEAVY CUTTER

Ream Cutter —— THE UNDERCUT —— Paper Mill Trimmer

New England

Boston, March 1, 1923.

Drastic Changes in Freight Rates Proposed

A paper freight rate case, involving such drastic revisions on paper as have never before occurred, barring the general rate revisions, has been proposed by the New England carriers. A hearing before the New England Freight Association on these proposed changes took place on February 28th. The railroads more than a year ago appointed a paper rate committee. This committee prepared the new schedule which has been under fire by the paper mills of the northeastern states. They propose to cancel all the favorable less carload rates now enjoyed in these states, by which the New England mills have been able to hold their own market against all outside competition. In place of the special commodity rates on less cars, they would establish straight 3rd class tariffs for all paper moving in less than cars. The advances that this would entail are excessive, as for example an advance of 17c to 44c per hundred pounds in the rate from Bellows Falls to Boston, of 14½c to 33c in the rate from Fitchburg to Boston, and of 24c to 44c in the existing tariff from Claremont to Boston. In addition to this all the carload commodity tariffs would be wiped out, printing paper would be put on a sixth class basis and news and board at 90 per cent of sixth, all of which would involve advances, except in the one conspicuous exception of the Holyoke-Boston rate, which would be reduced—the one instance of a reduction in the entire proposal, which is a reduction long overdue, but which coupled with increases in the l.c.l rates of smaller towns in the Berkshires would put the latter at a serious disadvantage.

This in brief is the proposal of the New England roads, on which paper mill attention has been focussed this past month. The hearing at the South Station, Boston, was preceded by a two-day conference of paper mill traffic men, who decided upon concrete counter proposals. These they presented in detail to the roads. Speaking for the New England Paper and Pulp Traffic Association, representing practically all the important book paper mills of New England, Chester L. Whittemore indicated in detail the effect of these changes. He intimated that the case would be dragged before the Interstate Commerce Commission if the railroads refused to take into consideration reductions on paper from New England mills to markets in trunk line territory, including New York City. In specific answer to the proposed elimination of the l.c.l. commodity rates, Mr. Whittemore, speaking not only for his organization but for the major part of the New England paper industry, requested fourth class rather than third on paper shipped in lots of more than 10,000 pounds. He pointed out that the radical advances proposed in rates from paper mill cities within 50 to 75 miles of Boston would merely reduce the railroad's total revenue from paper by driving a still larger percentage of the business to the motor trucks which already have a door to door rate as low as the railroads and much lower in some instances.

Calling attention to the many inequalities in New England paper rates to trunk line cities, such as New York and Philadelphia, the paper mill representative pointed out that loss of many orders by New England mills to trunk line competitors is directly traceable to the discriminating freight rates. It was recommended that printing paper from New England to trunk line points be classified on the "Anderson A" basis which would result in such typical declines as the following: Holyoke to New York now 22c, proposed 18½c; Rumford, Me., to Philadelphia now 34½c, proposed 29c; Berlin, N. H., to Philadelphia now 30c, proposed 28c. The New England Freight Association took the matter under advisement.

Big Dam Proposed

The most ambitious undertaking that any paper mill or group of paper mills has undertaken in the history of the industry, was formally launched in Maine during February, when a bill was introduced in the legislature of that state providing for the incorporation of the Kennebec Reservoir Co. Linked together in this project are such names and mills as Philip T. Dodge, president of the International Paper Co.; Garret Schenck, president of the Great Northern Paper Co.; Waldo E. Pratt, president of Hollingworth & Whitney Co., and Walter S. Wyman, of the Kennebec Paper Co. and the Kennebec Pulpwood Co.

It is proposed to construct a huge dam in the Dead River, which will create a lake 25 miles in length to impound 10 billion cubic feet of water to be 50 feet in height and which will require 10,000 yards of concrete. The flow of this Kennebec River, of which the Dead River is an important tributary, has been sporadic, full in spring to the extent of damaging property and of scarce sufficient size for washing paper in summer and fall. The dam will rectify the flow of water

Geared Turbo Generator Produces Too Much Power

THIS De Laval direct current geared turbo generator, as originally installed by the Crown Willamette Paper Co., was intended to supply direct current for graduated speed sectional drive of one of the largest newsprint paper machines ever built. The exhaust from the turbine is used in the dryer rolls, but it was found that the paper machine did not require as much power as the turbine would produce when supplying the amount of steam needed. A 500-kw. synchronous motor and generator was therefore coupled to the shaft of the 600-kw. direct current generator, and connected with the general A.C. distribution system of the mill. When operating as a generator, this A.C. machine makes it possible to load the turbine so that the proper amount of exhaust steam is produced. The alternating current thus generated reduces the amount of power to be purchased from an outside source for the remainder of the mill, while, if for any reason the demand for exhaust steam from the paper machine should be less in proportion than the requirements for direct current, the synchronous machine can act as a motor and help drive the direct current generator.

If you use steam for heating, drying or process work, you can produce power as a by-product, at an almost negligible cost for fuel and cheaper than you can buy it from a water power company. De Laval steam turbines are built in all capacities up to 15,000 hp., and for all steam conditions, that is, high pressure condensing or non-condensing, or for extraction or mixed flow service. By means of the De Laval speed reducing gear, they are used for driving machinery at all speeds.

Ask for Catalog D82

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Steam Turbine Co.

Trenton, New Jersey

LOCAL OFFICES: Atlanta, Birmingham, Boston, Charlotte, Chicago, Cleveland, Dallas, Denver, Duluth, Indianapolis, Kansas City, Los Angeles, Montreal, New York, New Orleans, Philadelphia, Pittsburgh, Salt Lake City, San Francisco, Seattle, Toronto.

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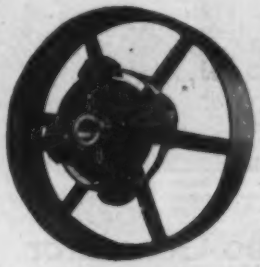

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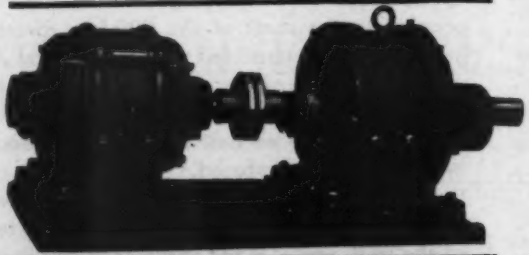
James Speed-Reducing Transmissions



James Transmissions eliminate complicated and open Gearing, Shafting, Belts and Pulleys, not to mention the great losses thru friction.
Send for Bulletin descriptive of our Speed Reducing Transmissions.
Manufacturers of cut Gears of every description.

D. O. James Mfg. Company
1114 W. Monroe St.,
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Provide Operating Economy

THE JOHNSON FRICTION CLUTCH

Single Clutch—Exterior

Complies With All Insurance Regulations

Its exterior is perfectly smooth without protruding parts.
No clatter—No Bang.
All working parts enclosed against dirt and dust.

A Few Machines Used on:

Butter Churns
Bottle Fillers
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Soap Wrapping
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Dye Jiggers
Bottle Labelers
Tire Wrapping
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Lathes
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Drill Presses
Boring Mills
Millers
Tobacco Machinery
Cigarette Machinery
Folding Machine

Write for Stock List and Catalog "PI"

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN

but in addition it will double the present available water power of the stream. Cheap power will allow for extension to present mill properties along the river of which the aforementioned companies are owners.

The State Entomologist of Maine, in a report on forest parisites dealing largely with the spruce budworm, advises paper and lumber companies to bestir themselves with preventative action if they do not wish to see further outbreaks of this pest denude Maine of her spruce and fir, making Maine paper mills dependent on Canada. His report giving specific information regarding the budworm, methods of control and prevention is worthy of the careful perusal of every paper mill forester. It emphasizes the susceptibility of fir to the budworm, but notes that fir is becoming a larger percentage of the remaining stand each year.

Bird & Son, of East Walpole, Mass., have developed and placed on the market a fibre case board made of waste paper, which is guaranteed to meet all railroad requirements for packing cases. Samples which have been provided for inspection of shippers have withstood every test made. The board is double lined with a special strong waterproof lining, giving double strength to the product. It is one of the most remarkable products of this mill, it is in every way the equal of wooden case board and occupies one-tenth of the space required for wooden cases.

The Boston & Maine Railroad has established a new regulation permitting the storage of paper of all kinds at Lowell, Mass., when said paper is routed to any point to which there is a through rate. This storage in transit privilege, provides of course that the shipment must come to Lowell on the Boston & Maine railroad. It is good for six months during which time the paper may be taken out and reshipped to points in New England without loss of the through rate subject only to a nominal transit charge.

Rice, Barton & Fales, Inc., of Worcester, Mass., famous makers of paper mill machinery, are constructing what is claimed to be the largest machine ever built for the manufacture of kraft paper. It will be 144 inches wide, will have a capacity of 700 feet per minute and will weigh in the vicinity of 1,000,000 pounds. It will not be ready for shipment before May or possibly not until June. It is for the Southern Paper Co. of Moss Point, Miss., and will be shipped to that place in more than 20 sections.

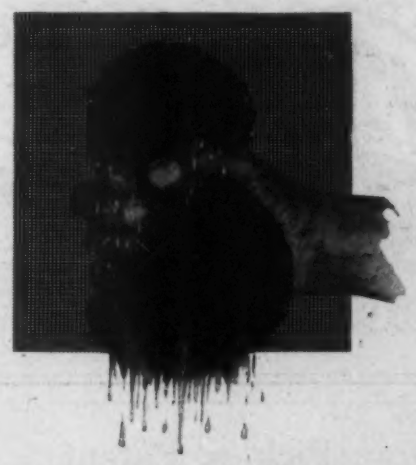
Eastern Manufacturing Co., instead of reporting the discouraging deficit that they were forced to announce in 1921, came out with a statement the first of the year showing profits of $150,000. The earnings would have been much greater but for an expenditure of $200,000 in installing equipment to burn oil rather than coal. The saving from this however has been so great that the company actually expects it to equal the cost of installation by the end of 1923.

The 48-hour law which almost succeeded passage in New Hampshire and which by its provision would have embarrassed several of the paper mills located in that state was finally defeated by a close vote in the state Senate. It had previously passed the House by a large majority. The democrats won the last election according to political talk from the Granite state by sponsoring this legislation.

Two excellent reports were made by the Falulah Paper Co. and the Fitchburg Paper Co., of Fitchburg, Mass., when they filed their annual statements at the State House Boston. The Falulah Paper Co. showed a profit and loss balance for their last fiscal year of $253,018. The Fitchburg Paper Co. showed at the end of their fiscal period surplus of $833,000 and reserves of $578,000.

At least three Maine paper mills are practicing actual reforestation. They include the Orono Pulp and Paper Co., of Orono, the Eastern Manufacturing Co., and the Pejepscot Paper Co., of Brunswick. All three own and log extensive spruce and poplar timberlands.

Mrs. Sophie Wheelwright, wife of George W. Wheelwright, died at her home in Jamaica Plain, Mass., the 1st of March. Sincere sympathy is extended by the trade to Mr. Wheelwright, one of the outstanding figures in the American paper mill world.



How Much Water Is Left Behind?

Squeeze a sponge and the water will come out of the larger openings—but what a paper mill superintendent wants is to have the water come out uniformly.

To make uniform paper, you must uniformly de-water the pulp. If there is a variation in the mesh or openings of the Fourdrinier Wire, there is bound to be a variation in the amount of water remaining in the pulp, and the paper cannot be finished uniformly.

Note the accuracy of the mesh in the piece of Tyler Fourdrinier Wire reproduced above! Here is uniformity that assures paper leaving the wire with a uniform percentage of moisture over the entire sheet.

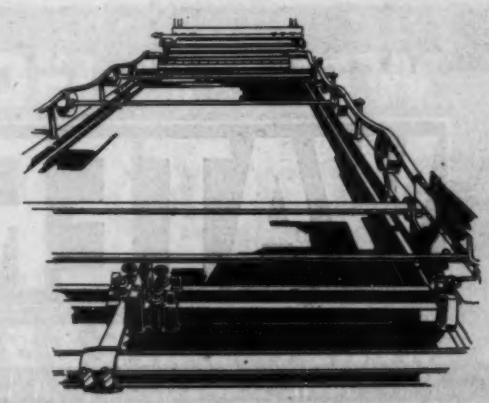
Tyler Fourdrinier Wires are woven in all widths up to and including 250 inch.

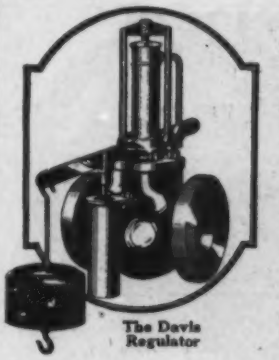
Send for sample

The W. S. Tyler Company

Cleveland, Ohio

Manufacturers of Woven Wire Screens and Screening Equipment





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FOR almost a half century—since 1875—Davis has been making better valve specialties. The hundreds of engineers who know them will attest that Davis superiority of design and construction shows up where it counts—in better service and in longer life.

The Davis series is partially listed opposite; it is completely described and illustrated in the new 64-page, 7½x10½ catalog. This book should be your valve-buying guide. Write the G. M. Davis Regulator Co., 414 Milwaukee Avenue, Chicago, for the copy waiting for you.

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Pressure Regulators
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Pickles' Patent Automatic Steam Regulator

FOR

Paper Making Machines

Which absolutely control the drying of the sheet. Installed on sixty days' trial

W. F. PICKLES Buckland, Conn.

PUMPS

INDUSTRIAL—AGRICULTURAL—MUNICIPAL—RESIDENTIAL

A Type for Every Service

THE GOULDS MANUFACTURING COMPANY
SENECA FALLS, N. Y.

GOULDS

Stickle Compound Condensing System

and Automatic Steam Control

for Paper Machines

As shown in the folder we sent out to the mills—"*How to Dry Paper*"—showing our Compound Condensing System for draining the dryers and heating the air with the discharge from the dryers to condition the machine room should interest you. We guarantee a saving of 20 per cent in steam consumed for this purpose.

Stickle Steam Specialties Co.

Indianapolis Indiana

Boston Philadelphia

WE-FU-GO AND SCAIFE WATER

PURIFICATION SYSTEMS
SOFTENING & FILTRATION
FOR BOILER FEED AND
ALL INDUSTRIAL USES

WM. B. SCAIFE & SONS CO., PITTSBURGH, PA.

George Abbott, electrical engineer of the Brown Co., Berlin, N. H., delivered an interesting lecture before a society of that town on super power plants, of which he is well qualified to speak from his experiences with Brown Co.'s great plants.

All employes of the Eastern Manufacturing Co., of South Brewer, Maine, are to get a wage increase the end of February. Nearly 1,000 will be affected. The exact amount of the increase was not reported.

The Hampden, Me., mill of the Becker Lumber Co., has been sold to the St. Croix Paper Co. The St. Croix Paper Co. will move the machinery and equipment of the lumber mill to Woodland, where their own mills are located.

The Nashua Gummed and Coated Paper Co., at Nashau, N. H., has incorporated their business in Illinois with a capital stock of $2,700,000, of which $316,176 is to be employed in the Illinois business.

The Burnside Tissue Mills of Hartford, Conn., were petitioned into bankruptcy on February 2. Fred Enders & Co. were the petitioners.

Fire on the 15th of February destroyed the paper mills of the Diamond Match Co., at Southbury, Conn. The loss was placed at $100,000.

Miami Valley

Middletown, Ohio, March 1, 1923.

Meeting of Superintendents

Mr. George Bearce, The News Print Service Bureau, New York City, addressed the monthly meeting of the Miami Valley Division of the Pulp and Paper Mills Superintendents' Association at the Hotel Manchester, Middletown, Ohio, February 24, 1923. He discussed "Waste in the Paper Industry," referring particularly to the reclamation of stock and white water losses. Mr. Bearce's address in part is published elsewhere in this issue.

An open discussion following Mr. Bearce's address brought out various views; differences of opinion were expressed on the use of the save-all in elimination of waste, use of which was advocated by the speaker.

Many of the paper millmen at the meeting expressed their intention of attending the superintendents' convention to be held at Springfield, Mass., beginning May 31st. It was practically decided that the Miami Valley delegation would go to the convention in a special car.

A change in the by-laws of the Association will be advocated by Miami Valley members who attend the meeting in Buffalo this month. They will make an effort to have membership privileges extended to others than only paper mill men.

Efforts to secure more members in the Miami Valley Division will be made, and Tom Harvey, of the Gardner-Harvey interests, and Charles W. Shartle, of the Shartle Brothers Machine Company, were appointed to visit the various mills in the valley for the purpose of interesting them in the aims and activities of the Association.

The next meeting of the Miami Valley Division will be held in Middletown the last Saturday in March. Other phases of waste in the paper industry will be discussed, including "Waste in the Finishing Room"; "Generation in the Use of Electricity", and "Waste in Steam Power Production."

Those in attendance at the meeting were:

George Harvey, Tom Harvey, Edward H. Butterfield, Jack Smith, A. R. Harvey, R. C. McDonald and B. M. Bishop, all of the Gardner-Harvey Company, Middletown; G. S. Martindale, Jack Mahoney, Raymond A. Steffen, Homer C. Ferguson, Charles Soule and F. A. Karls, of the Champion Coated Paper Company, Hamilton; H. W. Server and O. P. Gephart, of the Miami Paper Company, West Carrollton; Thomas O'Flynn and E. T. Judd, Wardlow-Thomas Paper Company, Middletown; A. J. Allison and F. M. Gloyd, of A. A. Swarck and Son Company; Thomas H. Keogh, Peerless Paper Company; William T. Schenck, Black-Clawson Company, Hamilton; John Calder, Wrenn Paper Company, Middletown; Charles W. Shartle and Adam E. Bridge, Shartle Brothers Machine Company, Middletown; R. C. Bevis, Shartle and Bevis Company, Middletown; William Battles, Franklin Board and Paper Company, Franklin; F. E. Moser, Oglesby Paper Company, Middletown; R. B. Roe, P. A. Sorg Paper Company, Middletown; L. T. Murphy, Auglaize Box Board Company; R. W. Martindale and C. E. Cole, Cincinnati Paper Board Company.

"TOLEDOS"
For Those Piping Jobs

You will find in "Toledo" Pipe Threaders and Pipe Cutters, all that you ever hoped for in pipe tools. Simple in construction, perfect in design and mechanical principle, they are strong, durable pipe tools that may be taken to the pipe anywhere it may be and the pipe threaded or cut off easily and accurately.

From the seventeen models cutting and threading up to pipe as large as 12 in., there are "Toledos" fitted for your particular needs. Any one is operated easily by hand, doing its work smoothly and quickly but may also be operated by a "Toledo" Power Drive—the portable electrical unit of operation—and the efficiency of the tools increased many times. With such a combination you would have the most modern and efficient of pipe tool equipment, at a fraction of the cost of power machines, with the added desirability of having tools that could also be operated on the pipe in position.

A post card will bring you complete details and our large catalogue

"Toledo" Power Drive Instantly Converts Hand Pipe Tools Into High Efficient Power Machines

THE TOLEDO PIPE THREADING MACHINE CO. Toledo, O.

New York Office, 50 Church St.

"TOLEDO"

TRADE-MARK REGISTERED

The word "Toledo" and this trade-mark on pipe tools means perfection. Insist on it

WATER
Filters and Softeners

The new **PAIGE-JONES** pressure sand filters, designed for paper mill use, embody the most approved features of construction, insuring a water clean and clear for manufacturing purposes.

PAIGE-JONES water softeners permit the correct **INTERNAL** or **EXTERNAL** treatment of boiler water as the individual case demands.

Write today for Descriptive Bulletins

Paige & Jones Chemical Co.

417 So. Dearborn St. CHICAGO
248 Fulton St. NEW YORK

NORWOOD FILTERS

Clean Water
Low Maintenance Cost
Reliable

NORWOOD ENGINEERING CO.
FLORENCE, MASS., U. S. A.

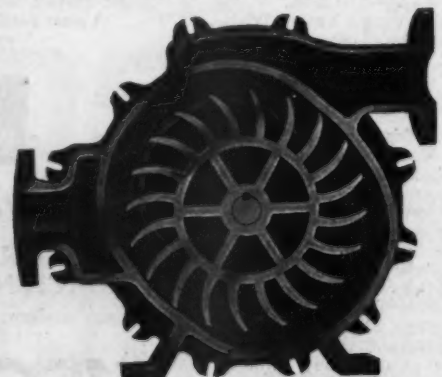
"NASH HYTOR" the SUPERIOR VACUUM PUMP for SUCTION ROLLS and FLAT BOXES

Absolute Reliability *Minimum Power* *Highest Efficiency*

PRODUCES THE MOST UNIFORM VACUUM THUS FAR INTRODUCED

THE HARLAND INTERLOCK ELECTRIC DRIVE FOR PAPER MACHINES IS SUPERIOR IN ITS FIELD.

MANY ORDERS FOR THE BIRD SELF-CLEANING SHOWER PIPE TESTIFY TO SATISFACTION GIVEN.



"Nash Hytor" Vacuum Pump

A combination of the Armstrong Trap and the Jennings Hytor Dryer Exhaust Unit is meeting with great success in handling condensate from the dryers of paper machines.

You are cordially invited to visit the booths of the Nash Engineering Company and Bird Machine Company at the Paper Industries Exposition, New York City, week of April 9th, where there will be an interesting display of specialties in operation.

For full particulars address

THOS. H. SAVERY, Jr.

1718 Republic Building **Chicago, Ill.**

When editors of business and trade journals from all parts of the country gather here March 26-27 for their annual convention, one of the features provided for their entertainment will be an exhibit of products manufactured in Middletown, and will include largely exhibits from the many paper mills in the city. L. C. Anderson, of the P. A. Sorg Paper Company, is in charge of the exhibit.

At a meeting of the Gardner-Harvey Mutual Benefit Association, held in Middletown, Saturday, February 17, S. J. Evans was elected president for the coming year; C. O. Farmer, vice president, and Russell Annes and Arlo Weber, directors. Following the business meeting, the members enjoyed a dance and social program.

Dr. Hugh P. Baker, president of the American Paper and Pulp Association, and George W. Sisson, former president of the Association, were guests of honor at a luncheon at the Hotel Manchester, Friday, February 16, which was attended by paper mill men from Middletown and other parts of the Miami Valley.

The Shartle Brothers Machine Company, of Middletown, is preparing to ship two large consignments of paper machinery abroad, one to China and the other to Great Britain, it was announced recently.

Kalamazoo Valley

Kalamazoo, March 1, 1923.

Kalamazoo Cost Men Hold Convention

The Third Annual Convention of the Cost Association of the Paper Industry, Kalamazoo Valley Local Division, was held at the Park-American Hotel, Kalamazoo, February 23.

The meeting opened at 3 p. m. with an address by Mr. Geo. K. Ferguson, Watervliet Paper Company, on "How to Establish a Machine Hour Rate." Mr. Ferguson's address, as well as the chart which he used in connection with it are published elsewhere in this issue. Following this address there was a very interesing and helpful discussion upon points brought out by the speaker.

At 6:30 dinner was served in the Banquet Room of the hotel. This was a very enjoyable and informal affair, after which the meeting opened again with a paper by Mr. Elbert Milham of the Bryant Paper Company. He talked on "Technical Control in Relation to Costs." Mr. Milham's paper, which was very well received, will also be found elsewhere in this issue.

Mr. F. E. Seidman, C. P. A., Seidman & Seidman, Grand Rapids, Mich., next talked on "Income Tax Factors that Effect Costs." Mr. Seidman proved himself to be a very interesting and convincing speaker.

The last talk given on the Cost Men's program was a discussion of "How Charges to Repairs, Replacements and Equipment Affect Costs." This was given by Mr. Geo. T. Jubb of the Kalamazoo Paper Company, and will be found elsewhere in this issue.

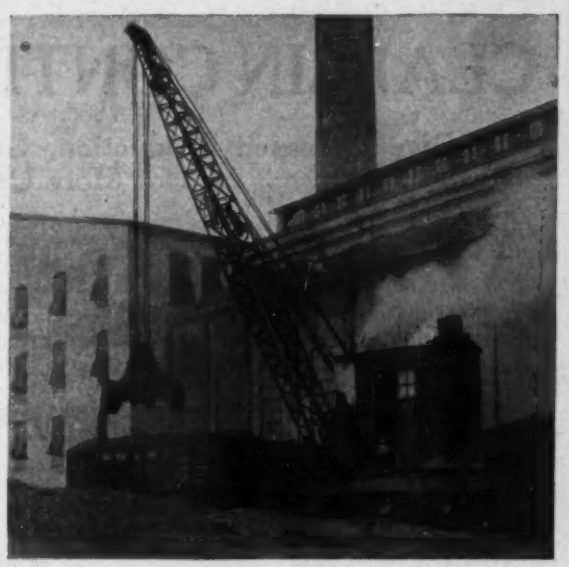
At the close of such a meeting one could not but feel that it had succeeded in all it had aimed to accomplish. Many ideas and cost methods were exchanged; problems were thrashed out; opinions and systems were justified and, contributing perhaps as much as anything to the success of this meeting, was the spirit of good fellowship and the friendships formed.

Michigan Superintendents Meet

The Michigan Division of the American Pulp & Paper Mill Superintendents held their monthly meeting at the "Park American", Kalamazoo, Mich., Thursday evening, Feb. 15th. After an enjoyable time around the banquet table, the members heard an address on the merits of "Boothal" as an efficient aid to the prevention of waste in the "white water", and the utilization of all the water. This address will be found elsewhere in this issue. It was to have been given by Mr. Booth, but owing to illness, he was unable to be present. Miss L. McGrath of the Booth Chemical Co., Elizabeth, N. J., was an ideal substitute, and it was the unanimous opinion of the members present, that in the future, should any speaker as scheduled be unable to be present, any lady with the ability to handle the subject matter as ably as Miss McGrath did her's, will be very welcome.

It was an unusually animated discussion and questions and replies were the order of the evening, making the meeting one of the best of the season.

Owing to the inclement weather the attendance was below the average, but a most enjoyable and very instructive evening was spent. A committee in charge of the radio broad-



Our Best Labor-Saving Device

Writing us recently the president of the Kalamazoo Vegetable Parchment Co. said, "We appreciate very much the receipt of your catalog, as it gives us a good many ideas which we will undoubtedly incorporate into our new mill.

"We are mighty glad to know that you make other things beside locomotive cranes, one of which we purchased from you some years ago, and which we have found in every respect the best labor-saving device that we have about our entire plant."

If you are interested in the handling of materials we want to remind you that Brownhoist is also interested in this subject. Over 40 years of engineering and crane building experience can be yours on any handling subject. And perhaps we can give you some valuable information, as we did the above company.

The Brown Hoisting Machinery Co.
Cleveland, Ohio

Branch Offices, New York, Pittsburgh, Chicago, San Francisco and New Orleans

BROWNHOIST

CLAFLIN CONTINUOUS BEATERS

Will Give Increased Production, Greater Economy, Stronger, Better and More Uniform Pulp

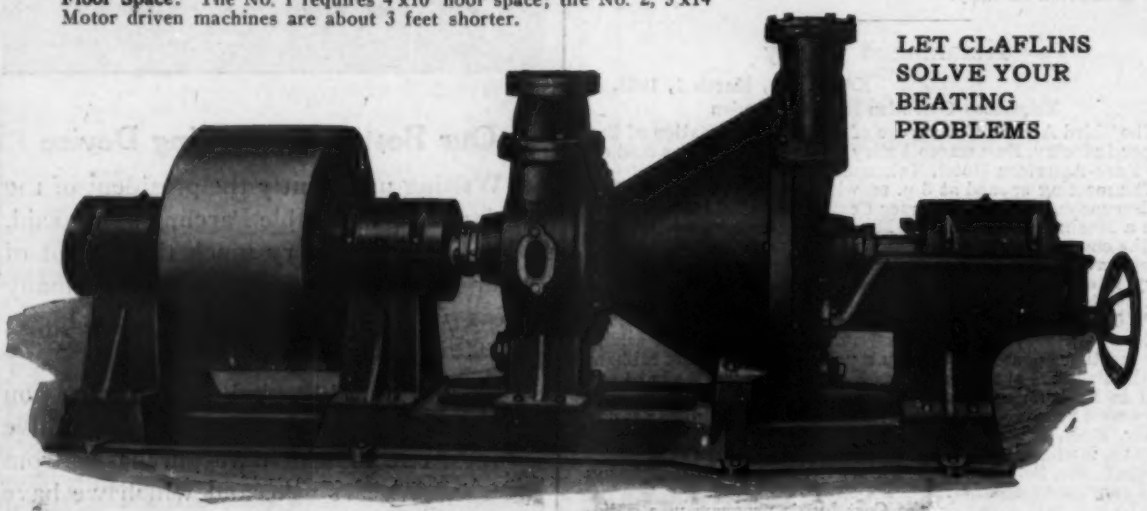
A COMPLETE unit will handle the hardest kind of stock direct from the cooker and prepare it for the Paper Machine without any regular Beating Engines and do this with a saving on the original installation, on the power consumed and on repairs.

They **"Can't be Beat for Stuff that's Hard to Beat,"** are unexcelled for **Rope Manila, Leather Board, Sulphite Screenings, Wall Board, Kraft Paper and Waste from Pulp Stones,** and when used in connection with tub-beaters they will save 25% to 50% of the time usually required in the tub-beaters.

GENERAL SPECIFICATIONS

Sizes: CLAFLINS are built for either belt or motor drive, and in two sizes. The No. 1 is the smaller machine and is used for ordinary beating or refining; the No. 2 is our Heavy Duty machine.
Floor Space: The No. 1 requires 4'x10' floor space; the No. 2, 5'x14'
Motor driven machines are about 3 feet shorter.

LET CLAFLINS SOLVE YOUR BEATING PROBLEMS



NO. 2—CLAFLIN CONTINUOUS BEATER

Horse Power: This will vary on different stocks, but the average for the No. 1 is 60 H. P. and 100 H. P. on the No. 2.

Speed: The speed of the No. 1 is 450 R. P. M.; that of the No. 2 is 400 R. P. M.

Capacity: The capacity of the No. 1 is from 20 to 25 tons in 24 hours; the No. 2 has 60% more capacity.

Driving Pulleys: The standard pulley for the No. 1 is 26" dia. x 16" face; for the No. 2, 36" dia. x 20" face.

Bearings: The new Model **CLAFLINS** have Water-cooled, collar-oiling bearings and a double ball thrust bearing, and are built throughout to withstand long, hard service.

Inlet and Outlet: The No. 1 has a 6" inlet which can be enlarged to 6"x12" and a 4" outlet. The No. 2 has an 8" inlet which can be enlarged to 8"x20". The outlet on this machine is 7".

Knives and the Arrangement of Filling: The knives used in **CLAFLINS** are much heavier than those used in a Jordan. Our standard knife is ½" thick and is made of a very high grade alloy steel and will never break or tear out. The knives in both plug and shell are set at an angle of 10 degrees from the center line, but in opposite directions in each, so that they cross each other at this angle when the machine is in operation. This, in a large measure, is responsible for the superior beating and brushing action of **CLAFLINS.**

Refilling: CLAFLINS are quickly and easily refilled by any mechanic. A new cone turned up, balanced and filled with wood is slipped on the shaft in place of the old one. The shell knives are put in place and backed up with wood fillers.

THE HERMANN MANUFACTURING CO.

Successors to
THE CLAFLIN ENGINEERING CO.
LANCASTER, OHIO

Our Canadian Agents
CANADIAN FAIRBANKS-MORSE CO., LTD.,
MONTREAL, QUEBEC

casting program as brought forward at the last meeting, reported splendid progress had been made in the matter. The Paper Industry prepared an address on this subject and has been sent out from a number of stations throughout the country. Those having radio sets were advised to wipe the dust off the their tubes and listen in during this period.

New Mill for Kalamazoo

Edwin H. Hacking, 21 Chase Block, Kalamazoo, Mich., is working on plans for a new paper mill which will be erected a short distance east of the city. The site which will undoubtedly be selected is located on the Kalamazoo river and on the main line of the Michigan Central Railway.

Dan J. Albertson of Kalamazoo is the architect drawing up the plans. Mr. Hacking was, until recently, secretary of the Rex Paper Company.

Relining with Maphite

Maphite is a mineral that, the manufacturers say, has been shown by scientific tests and tests under actual operating conditions to be a mineral that possesses extraordinary heat-resisting qualities. It is sold in two forms, as a thick paint and as a dry powder.

Both forms are used in making the first application on old linings. The powder is mixed with the paint to make a thick paste, and this paste is applied with a trowel, and is used first for filling the burnt-out places in the old lining. After the wall is leveled with the paste, a coat of the Maphite paint

View showing destructive action of the fire

Same walls after being restored by Maphite paint

is applied. The action of the flames vitrifies this coating and it forms a heat and abrasion resisting lining of meteor-like hardness.

The Maphite sticks like glue to all surfaces over which it is applied and does not require heat to bind it. For this reason, there is no trouble whatever in applying it to a suspended arch.

After the first application of Maphite, an occasional coat of the Maphite paint keeps the walls and arch in excellent condition and does this at practically no expense.

Note the two arches here illustrated. The upper photograph shows plainly the destructive action of the fire. The other photograph shows the same furnace after being restored by the Maphite process. A coat of paste was first applied, and this was followed by two coats of paint. The work was done, and the boiler back on the line, in thirty-six hours. The photographs are of a furnace at the Alton Box Board and Paper Co., Alton, Ill. The 350 h. p. Stirling boiler is regularly delivering 500 to 750 h. p.

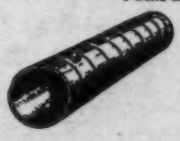
The Uehling Instrument Company, manufacturers of CO_2 recorders and other power plant gauges has placed Mr. Charles J. Schmid in charge of sales in Greater New York and Long Island. Temporarily Mr. Schmid will make the home office in Paterson, N. J., his headquarters.

The Mid-West Wall Paper Mills of Joliet, Illinois, incorporated February 16, with a capital stock of $95,000.

Stevens Tank and Tower Co.

9-23 Center St. - - - - - - Auburn, Maine

Wooden Tanks, Tubs, and Vats



Wooden Penstocks, Acid Towers, etc.

Inbuilt strength and durability are features of all products manufactured by this company. Handy pocket size catalog mailed upon request.

Established 1863

Wood TANKS and VATS

All Kinds and Constructions for Every Purpose

Our Factory, Material, Service and Prices are to Your Advantage

E. F. SCHLICHTER CO.

10 S. 18th Street, Philadelphia, Pa.

WOODEN TANKS

Are Good After 30 Years of Service

Many of our tanks built of Genuine Red Gulf Cypress are still on duty after giving more than thirty years of satisfactory service.

We carry no tanks in stock—all are accurately made to order for your special purpose.

Our Slogan—"Satisfied Customers Only"

Write today for information that should be in your possession. This is a part of our Co-operative Service.

Pittsburgh Office
506 BAKEWELL BLDG.

20-Ton "Industrial" Crane Saves $24,000 a Year Over Hand Labor

Handling over 60,000 tons of Ore and Coal a year at a saving of $24,000 is the record of the above 20-ton "Industrial" Crane, used by the Pennsylvania Salt Manufacturing Company of Greenwich Point, Philadelphia, Pa. It was the second "Industrial" purchased by that company, the first (smaller) one having given so much satisfaction that they naturally bought another "Industrial." "From our 18 years' experience with 'Industrial' Cranes," says Mr. H. Dufor, superintendent of the company, "it seems fair to estimate that our present Crane will be good for at least 20 years. The Crane operates about 275 days in the year. . . . The 'Industrial' Crane has proved very satisfactory, and we have shown our faith in it by our re-order. One of the facts contributing to our satisfaction is the excellent service which we get from the manufacturers."

Here is another link in the long chain of evidence that an "Industrial" is the Crane that will best repay YOUR wise investment.

Write for our illustrated catalog No. P-109

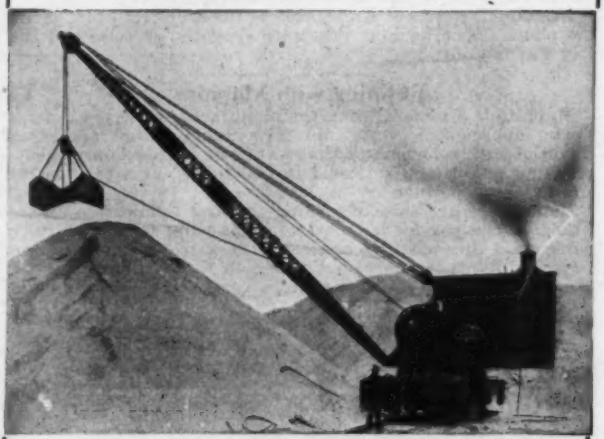
INDUSTRIAL WORKS, Bay City, Mich.

O. S. Dependable Cranes

Indispensable for the rapid and economical handling of materials.

Capacities, 7 to 60 Tons

Write for Catalogues 18 and 21



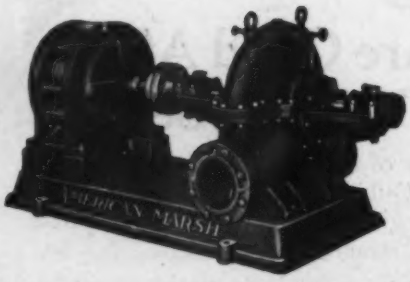
Orton & Steinbrenner Co.

Offices CHICAGO, ILL. Shops HUNTINGTON, IND.

Branch Offices in all Principal Cities

American-Marsh Paper Mill Pumps

Centrifugal and Direct Acting



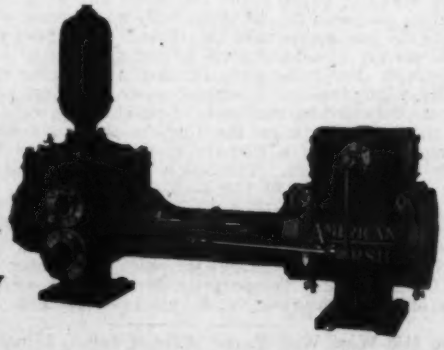
ESPECIALLY adapted for paper mill service where absolute reliability and high efficiency are required. There is an American-Marsh pump for every paper mill requirement, from draining the rolls on the dryers to handling heavy paper pulp stock.

Because of the fact that the factory is located in the heart of the largest paper mill district in the world, we have always made a specialty of paper mill pumps and our designs are the result of careful first hand study of the actual requirements.

The line includes

Boiler Feed Pumps	Jet Condensers
Centrifugal Pumps	Air Compressors
Stock Pumps	Vacuum Pumps
Deep Well Engines	Power Pumps

May we send you our general catalog?



American Steam Pump Company

Battle Creek, Michigan

Salesmen Hold Numerous Luncheons

Luncheons for the various regional groups of the Salesmen's Associations of the Paper Industry for Middletown, O., New York and Boston, were a February feature of the activities of the salesmen. While the New York and Boston luncheons were part of the plan for monthly meetings of the paper salesmen of those regions, the Ohio meeting was planned for February 14 as a special event, because of the visit to Ohio of Dr. Hugh P. Baker, who is secretary of the national salesmen's organization, as well as executive secretary of the American Paper and Pulp Association.

The New England division in arranging for a series of informal luncheons, scheduled the first for Thursday, February 15, at the Boston City Club. It is planned to have these meetings made a monthly event for the New England district, just as has been done in the case of Chicago and New York, where the meetings are steadily gaining in attendance and growing in importance.

The New York division's February luncheon was set for Tuesday, February 20, and like the Boston luncheon was a free and informal discussion of general conditions in the industry as well as of means for improving the work of the association.

Meanwhile the Chicago luncheons are now to be considered fixed events, but the Chicago salesmen are always glad to have their eastern conferes to plan their visits to the west that they can attend the luncheons held each Monday at 12:30 in the old Colony Club of the La Salle Hotel.

Personals

Carl H. Schorske, who for the past 28 years has been connected with the firm of Henry Lindenmeyr & Sons, paper dealers of 32 Bleecker street, New York, has severed his connection with that concern to become affiliated with the M. L. Macauley Company, paper mill agents of 30 East Forty-second Street, New York. Mr. Schorske began his long period of service with the Lindenmeyr firm as an office boy and gradually worked his way up to manager of the wrapping, cordage and specialties department. In his new connection he will assist in handling the sales of the several mills which the Macauley Company represent.

Erik Fernstrom, president and general manager of Fernstrom & Company, of Stockholm, Sweden, recently arrived in the United States for a business and pleasure visit. He plans staying in New York for about a month, following which he will tour the country, going to the Pacific coast. While in New York he is making his headquarters at the offices of the Fernstrom Paper Company, Inc., of 150 Nassau street.

Mr. Cloyd M. Chapman has become affiliated with Dwight P. Robinson & Company, Incorporated, as Consulting Materials Engineer. Mr. Chapman, who has been active in the work of the American Society of Testing Materials and the American Concrete Institute will in the future represent Dwight P. Robinson & Company in the committee work of these societies.

Paul T. Buckler, for fourteen years with the Detroit Stoker Co. as manager successively of the Pittsburgh, Cleveland and New York offices, is now with the Power Specialty Company, for whom he is assisting the New York office, in the sales of Foster Superheaters and Economizers.

Emanuel Salomon, president of the Emanuel Salomon Corporation, importers of and dealers in wood pulp and paper stock of 300 Madison Avenue, New York, sailed from that city on February 21 for a business trip to Europe. He will be abroad about a month.

Albert W. Honywill, Jr., has severed his connections with the Terry Steam Turbine Company at Hartford, Conn., to take up his new duties as assistant to the president of the Diamond Power Specialty Corporation of Detroit.

Gardiner S. Haring announces the dissolution of the Haring Paper Corporation, of New York City, and his association with the Hudson Trading Company, suppliers of news print of 300 Madison Avenue, New York.

Robert Stevens, Jr., formerly superintendent of the O. B. Andrews Company of Chattanooga, Tenn., has recently become connected to the Inland Paperboard Corporation at Versailles, Conn.

According to word recently received Mr. Wilfred Billings has resigned as superintendent of the Hoboken Paper Mills Company's plant at Rossman, N. Y.

Paper Mill Machinery in Stock Furnished Rebuilt and Guaranteed

"Not Where Is and As Is"

COMPLETE PAPER MACHINE—80" trim. Made by Pusey & Jones. Fourdrinier, two presses, 20 dryers, one stack of calenders, reel, winder, marshall drive.

FOURDRINIER TISSUE MACHINE—One 68".

FOURDRINIER PARTS—Pusey & Jones 112", 100" equipped with new Century shake. 90" Kutter Trowbridge.

PRESS PARTS FOR PAPER MACHINES—Pusey & Jones bell crank housings and Black & Clawson swing arm housings. Press rolls 18"x110" and 20"x88".

DRYERS—Four 48"x111". One 36"x89". Two 30"x84". Nine 34"x62". Two 36"x74". Four 48"x72". Four 48"x68". One 84"x67". Eleven 42"x96". Eight 36"x62". Two 36"x48". Four 20"x39".

CHILLED CALENDERS—One 82" seven roll and one 84" nine roll made by Farrel. One 86" six roll. One 82" five roll. One 66" five roll. One 88" five roll. One 54" five roll.

SLITTERS AND WINDERS—One 84" four drum and one 72" two drum M. & W. winders with slitters. One 120" Warren. One 108" Kidder. One 40" Langston. One 40" Kidder. Two 48" core cutting machines.

BEATERS—Three 72"x42", two 54"x54" N. & W. One Holyoke 84"x80". One Dilts 62"x50" iron tub. One Jones 62"x52". One Dillon 60"x48". Two Emersons 54"x50". Three Downingtown 54"x42" iron tubs. One Jones 42"x38". Six Horne 36"x36". One N. & W. 36"x36". Two No. 2 Claflins.

JORDANS—Two Jones Imperial. Two No. 2 Dillon Improved. Two Monarchs. One large and two small Horne. One Jones Standard. One small Emerson. One Appleton Wagg Majestic. Four Stevens digesters. One Pope brushing.

SCREENS—Three 12 plate. Two 8 plate open side Packer. Two 6 plate. Three white auxiliary and one Moore & White auxiliary. One single cylinder Wandel.

STUFF PUMPS—Deane triplex 9"x8". Goulds triplex 8"x12". Goulds triplex 6"x12". Beloit duplex 6"x14". Two P. & J. duplex 8"x10". Two 6" P. & J. single plunger. Twelve 5" post stuff pumps.

REVOLVING SHEET CUTTERS—62" and 84" Moore & White. Four 60" and one 86" Hamblets. One 48", one 45" and four 60" Finlays. One 82" and 62" and 48" Clark. One 50" Hamblet diagonal.

REAM CUTTERS—Two 48" Acme. Two 42" Cranston under cut.

SUPER CALENDERS—One 52", one 45", one 42", one 36" Holyokes. One 45", one 40" P. & J. One 45" Granger.

WET MACHINES—Four 72" Bagley & Sewall hydraulic. One 58" N. & W.

ENGINES—American Ball variable speed 120 H. P. and one 7"x10", one 10"x10". One 12"x30" Putnam.

Two Daniels Rag Cutters — One Manistee Hog Chipper
One 50" Farrel Board Calender — One Ryther & Pringle Shredder
One screw and two hydraulic Holyoke presses

We have a large number of pumps and over five hundred calender, press and couch rolls in stock

FRANK H. DAVIS COMPANY

175 Richdale Ave., Cambridge 40, Mass.

A. D. COOK, Inc.

Lawrenceburg Indiana

FIG. NO. 30

Manufacturers of Deep Well Pumps, Working Barrels, Rods, Foot Valves, Strainers and a full line of Water Well Supplies.

The accompanying half tone shows the COOK Patent Brass Tube Well Strainer with Standard Fittings, which are Bail Plug in the bottom and Foot of Blank and Lead Packer on top.

When the COOK Strainer is properly selected for the water bearing sand, capacity and method of pumping, it will successfully deliver the maximum yield of the well for many years free from sand and the troubles incident thereto.

Write for Bulletin 30A

Superintendent-Manager Wanted

Bi-sulphite liquor by-product plant. Must be familiar with various processes and have had successful experience in plant operation. State salary desired, experience, etc. Apply Box 45, The Paper Industry.

WANTED

Chemist with good education and experience in manufacturing sulphite, for Mill Control Laboratory of large establishment manufacturing Pulp and Paper.

Must be of proved ability and capable of handling a staff. The right man for this position can count on good prospects. State qualifications in full and salary wanted in first letter. Address The Paper Industry, Box 47.

Wanted

FIRST-CLASS foreman for steam department of two-machine newsmill. Equipment: 3300 horsepower B&W and Edgemore boilers; American Ball engines on machines; two Curtis turbines, 600 KW. each, run about two months each year. Must be capable man and know how to effect economies. Good small city. Middle West. Apply with full particulars. Box 48 News Mill, c|o Paper Industry.

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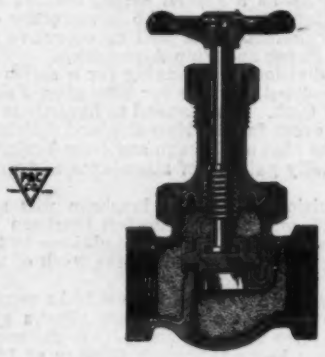

IT IS real economy to install Pratt & Cady Bronze Union Bonnet Renewable Disc globe and angle valves. It is so easy to replace parts subject to wear that you are sure to take advantage of this feature.

P & C folder No. 2 describes this valve in detail. May we send you a copy?

Reading Steel Casting Co., Inc.

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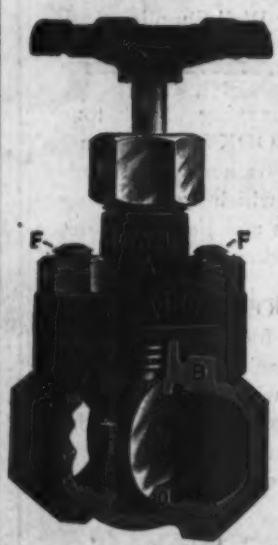

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Fig. 106. Jenkins Standard Brass Globe Valve, Screwed.

There seems to be no limit to the usefulness of a Jenkins Standard Brass Globe Valve.

We will supply this valve fitted with a special disc for steam, hot or cold water, air, gas, and other fluids and vapors.

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Jenkins Valves

SINCE 1864

Obituaries

John M. O'Connell

John M. O'Connell, for more than 25 years a salesman for the Miller & Wright Paper Company, of 65 Duane Street, New York, died suddenly in the Chelsea Hotel at Atlantic City, on February 11, of acute indigestion. Mr. O'Connell was 56 years of age. He was widely known in the trade and came from a family of paper men. His father was formerly in the paper business on Duane Street in New York, and his brother, Daniel J. O'Connell is president of the Box Board & Lining Company, of 10 Grand Street, New York, one of the largest box board concerns in the metropolis. The deceased was at one time with Henry Lindenmeyr & Sons prior to going with the Miller & Wright Paper Company.

Eugene U. Kimbark

Eugene U. Kimbark, 56 years old, vice president and general manager of the Paper Mills Company, Chicago, and former president of the National Paper Trade Association and the Western Paper Dealers Association dropped dead in the yard of his home at Evanston, Illinois, February 25.

Immediately prior to his death, Mr. Kimbark was in apparent good health. Heart disease is given as the cause of his sudden death. He is survived by his widow, three sons and two daughters.

Henry Henningson

Henry Henningson, assistant superintendent of the Hawley Paper Company, Oregon City, Oregon, after but a few hours' illness, died at his home February 25. Mr. Henningson has been in the employ of the Hawley Paper Company for the past fifteen years.

Orrin E. Martin

Orrin E. Martin, who was one of the first manufacturers of ground wood pulp in northern New York, and the president of the Martin Pulp and Paper Company, died at his home in Norwood, N. Y., February 8.

Guilford Smith

Mr. Guilford Smith, president of the Smith & Winchester Manufacturing Company, South Windham, Connecticut, died on February 9.

Odorless Manufacture of Chemical Pulp

Swedish cellulose industries, in general, under the supervision of E. L. Rinman, have completed experiments with the satisfactory results of a newly invented method of producing cellulose, which is proved superior in many respects to the old vile-smelling methods. Rinman works with lyes that are free from sulphur, and succeeds in producing chemical products of high value from the organic substances which have been dissolved by the waste lye; while the sulphate method uses sulphur-bearing lyes, and consumes as fuel the organic substances contained in the waste lyes; though not unlike in the actual production of cellulose, the two methods differ essentially in the composition of the boiling solvent, as well as the further treatment of the waste lye.

Dr. Rinman has succeeded in making the manufacture of cellulose entirely odorless by using sulphur-free lye, thereby solving a most vexing problem which innumerable efforts in the past have failed to solve. There is, at the same time, great economic advantage in being able to utilize the large amount of organic substance, comprising 50 to 65 per cent of the volume of the wood, which escapes during the boiling of the cellulose and passes into waste lye.—"Canadian Chemistry and Metallurgy."

Chemical Association Asks Co-operation

The Chemical Equipment Association, comprising manufacturers of the diversified equipment used in the twenty or thirty chemically controlled American industries, which recently began a national work for the advancement both of chemical equipment interests and the interests of the industries which its members supply, has now begun some very important industrial work in support of these purposes, according to announcement just made by its Board of Directors.

The announcement is accompanied by an appeal for co-operation in an informative way by the associations in each of the great industries which manufacturers of chemical equipment supply.

The Chemical Equipment Association welcomes and requests the co-operation of individuals, companies or associations in a position to assist in the work of its important committees. These may communicate with the Association at its executive office, 1328 Broadway, New York City.

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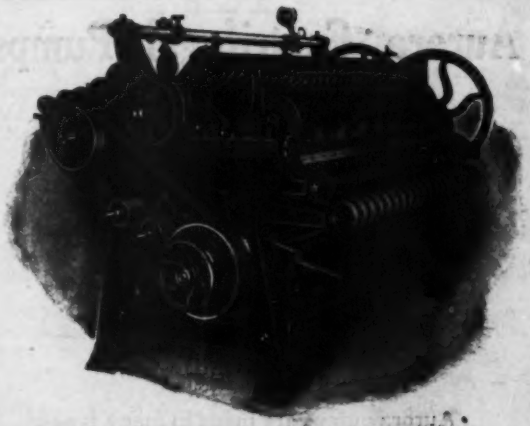
Portland, Ore., Seattle, Wash., St. John, N B.
Vancouver, B. C.



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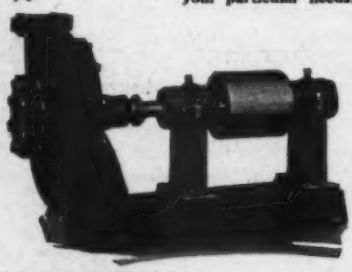

Fig. 192 illustrates Taber V Type open impeller Centrifugal Pump, built with double oil ring bearing for heavy duty. Also an auxiliary bearing within the pump proper.

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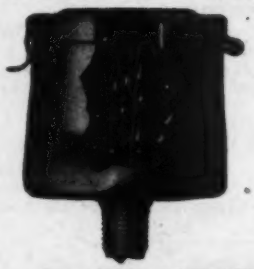

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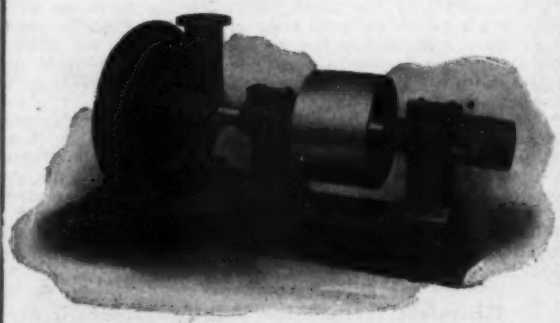

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BERLIN, N. H.

Promotions for Officials of Nepco

The annual meeting of the stockholders of the Nekoosa-Edwards Paper Company of Port Edwards, Wisconsin, and the meeting of the directors immediately following, made some important changes in connection with the line up of the official family.

Mr. Lawrence E. Nash, who has been the Manager of Sales for nearly one quarter of a century has had added to his title, Vice President. He still retains the position as head of the sales department and will have the same immediate touch with the trade as heretofore.

Mr. B. T. McBain, who has been Director of Manufacturing, has been made Assistant General Manager of the Company. The change in title will include the duties and oversight, the same as when he was Director of Manufacturing.

Mr. L. E. Smith, who has been with the Nekoosa Edwards Paper Company for some twenty-five years in several capacities, but principally in the handling of its chemical pulp, both Sulphite and Sulphate, was promoted to General Superintendent over all the mills producing chemical pulp. This includes Port Edwards and Nekoosa.

Overcoming Afternoon Fatigue

Office managers, manufacturers—in fact, practically all employers of labor, realize that fresh air is a dominating factor in the efficiency of their workers. As a result afternoon fatigue and listlessness of these employees are quite correctly attributed to bad air conditions.

Open windows do not satisfactorily solve the problem because the workers are often exposed to drafts and sickness.

American Blower Company ventilating engineers report that they have made it possible to keep office and plant atmosphere fresh and invigorating throughout the year. By the simple installation of American Blower Ventilating Fans, offices may be filled with fresh and invigorating outdoor air, and the poisonous, stagnant air quickly removed.

The Paper Mills Company of Chicago and The Chicago Paper Company, Chicago distributors for S. D. Warren Company mills, Maine, gave a dinner and moving picture lecture to a representative gathering of Chicago printers numbering about 700, at the Hotel La Salle on Wednesday evening, February 21, 1923. The meeting was presided over by Eugene U. Kimbark, late vice president and general manager of the Paper Mills Company. The illustrated lecture was given by Jeffe W. Clark, of the S. D. Warren Mills, and aside from showing the various processes of paper making from the forests to the finished product he included many interesting remarks relating to printing problems and solutions for overcoming same.

Link-Belt Price Is Lowered

A most interesting announcement is the statement recently issued by the Link-Belt Company of Philadelphia, Chicago and Indianapolis, that the price of their Portable Belt Conveyor, the "Cub," has been slashed more than 16 per cent. This machine formerly sold for $700. The new price is $585, complete with 2 H.P. electric motor, and bears the Link-Belt guarantee.

The "Cub," we are informed, is even a more sturdy loader than the machine which sold at the higher figure. It weighs almost twice as much as similar machines of its size and class. The 18" wide conveyor belt, running at 250 feet per minute, and with uniform feeding, has a capacity of 45 cubic feet per minute.

The Boston offices of Wing & Evans, Inc., sales agent for The Solvay Process Company, have been moved to 77 Summer St. The new and improved offices are very conveniently located for the trade. All sales of Solvay Soda Ash, Caustic Soda and Modified Sodas for the New England territory are handled through this office.

The latest book in the "Monograph Series," published by the Chemical Catalog Company, Inc., New York City, treats the subject of "Glue and Gelatin," by Jerome Alexander. Anyone making a study of these materials will find this a very complete work on the subject, treating it in a general way as well as relating it to specific industries.

A. W. Woolls, formerly with the wood pulp firm of Fred Enders & Company, Inc., of New York, has joined the sales force of the E. J. Keller Company, of 200 Fifth Avenue, New York. Mr. Woolls will be in the pulp department of the Keller Company under A. G. Sleicher, manager of the department, and will travel through the Middle West territory.

A group of paper mill men, including D. C. Everett, general manager of the Marathon Paper Mills Company; C. C. Yawkey, president of the same company; Walter Alexander, vice president of the Marathon Paper Mills Company, and others, it is reported, has purchased the partly finished pulp mill of the Northern Fibre Company, at Ontonagon, Michigan.

Fire of unknown origin on February 24 destroyed the warehouse of the Andrew Ragone Company, Inc., packers of paper mill supplies at 321 Pearl Street, New York City. The company has secured new quarters at 5-9 James Slip, New York, where it has resumed the grading and packing of waste paper and rags.

The Pulp & Paper Products Co. of Norwich, Conn., which has recently commenced operations in an old mill near Norwich, has added several items of new machinery and it is reported will be making various other improvements in the near future.

The Hollingsworth & Whitney Co. of Boston has purchased important water power privileges on the St. Croix River. It is reported the purchase is preliminary to the construction of a big pulp and paper mill on either the Canadian or American side of the river.

A pamphlet describing the Combusco Water Seal Ash Conveyor has recently been issued by the Combustion Engineering Corporation. The ash conveyor which is described therein is of a distinctly new type in this country though a number of successful installations have been made with it in Europe.

Henry Ford's paper mill at River Rouge, which began operations last year, expects soon to install a new wood cooking process which will, it is considered, materially increase production.

The West Coast Pulp & Paper Co., Olympia, Wash., a subsidiary of the Hawley Pulp & Paper Co., will soon commence the erection of a newspaper and sulphite pulp mill, with other necessary buildings.

The Oak Cliff Paper Mills, Inc., Dallas, Texas, are reported to be planning the immediate erection of an addition to their plant for the production of corrugated and fiber board, which will cost $150,000.

The Phillips-Morgan Estates of Kansas City, Missouri, has in preparation plans for a new paper mill consisting of two sections. Contract will be handled by the D. H. Greene Construction Co., also of Kansas City.

Mr. T. J. Cleary, who has recently opened an office in Atlanta, Georgia, for the sale of power plant equipment, has been appointed southern agent of the Combustion Engineering Corporation.

The Ryther & Pringle Company, manufacturers of pulp and paper mill equipment, of Carthage, N. Y., have filed notice of an increase in capital from $15,000 to $150,000.

The name of The Open Coil Heater & Purifier Company has been changed to Stickles Steam Specialities Company, at Indianapolis. Mr. Cole Stickle is president.

The New York offices of the Great Northern Paper Company have been moved from 30 East Forty-second Street to the Canadian Pacific Building at 342 Madison Avenue.

Fire recently destroyed part of the paper mill of the Diamond Match Co., Southbury, Conn. We understand this will immediately be rebuilt.

Hollis W. Martin, Norwood, N. Y., and others, will build a new paper mill near Potsdam, N. Y., it is reported.

TRANSLATIONS

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Examinations
Reports
Estimates of Cost
Designs
Specifications
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New York, March 1, 1923.

TRADE activity in practically all kinds of paper and board is of broad compass, and the industry as a whole is steadily assuming a stronger and healthier position. Consumers are placing orders for large amounts of paper against actual requirements, manufacturers are finding it necessary to gradually increase their operations to comply with the wants of customers, while prices of paper with very few exceptions incline upward and seem destined to reach higher levels in the near future.

The second month of the new year has come and gone, and there are numerous indications that the paper industry of the United States is well on the road to establishing new records along several lines in 1923. Complete figures of January production are not yet available, but judging from the newsprint output and reports from various mill centres, the output of paper during that month was close to a record level. Current reports tell of a continuance of heavy production during February, and, with such an encouraging start and with prospects for the future as bright as they are, one seems fully justified in predicting that the mills of the country are going to make a new record of paper production this year.

If anything, the situation at the moment is stronger than it was a few weeks ago. There was, along about the first part of February, some little slowing down of activity in the industry, this being due largely to apprehension felt over the political developments abroad and the fear that business in paper and board was expanding at too rapid a rate to be altogether healthy. In the meantime, however, confidence has been increasing; demand has further broadened, and there is a firmer undertone in the market. The political situation in Europe evidently has been thoroughly discounted; if anything, the United States is endeavoring to disregard this development as a business factor in this country; manufacturers and merchants are extending their efforts to improve business, and there is a more confident feeling regarding the outlook.

Export business in paper is increasing at a very satisfactory rate, and this is proving to be one of the strong factors in the situation today. While exports of paper from the United States in 1922 were below those of the preceding year, the constant growth during the last few months of last year can be viewed as a very gratifying indication for the current year. During 1922 exports of paper from the United States were valued at $24,152,567, showing a decline of $4,877,106 as compared with the 1921 total of $29,029,673. However, in the last eight months of 1922 our paper exports were valued at $16,616,441, which recorded a gain of $4,401,529 over exports totaling in value $12,214,912 in the corresponding period of 1921. A further analysis of export statistics shows that the decline in exports from the high figures of 1920 reached the low level in July, 1921, when exports amounted in value to $1,335,640. Since that time there has been a gradual increase, reaching a total of $2,270,196 in December, 1922, the highest monthly total since March, 1921. This would indicate the probability of a continued increase in export business during 1923.

The growth of the Unted States export trade in paper may be observed from the fact that our paper exports were valued at $7,180,014 in 1903, $8,064,706 in 1908, $11,686,584 in 1913, and $24,152,567 in 1922. Although it must be considered that prices in 1922 were practically double those for pre-war years, yet, even when this difference in price is taken into consideration, a steady growth in our paper exports is manifest both as regards tonnage and value.

The Federal Trade Commission report on the print paper industry for January shows that production of newsprint was resumed during the first month of the new year close to a record level following some slowing down of manufacturing activity in December, probably occasioned by celebration of the holidays. Production of total newsprint by United States mills in January amounted to 172,452 net tons, compared with 119,404 tons in the preceding month, 105,808 tons in January, 1922; 123,830 tons in January, 1921; 129,663 tons in January, 1920; 116,154 tons in January, 1919, and 105,700 tons in January, 1918. A total of 73 mills reported to the Commission in January.

Of the 127,452 net tons of total newsprint produced in January last, 117,497 net tons were standard news, which production is contrasted with 110,803 tons of standard news produced in December last, 98,702 tons in January a year ago, 113,764 tons in January two years ago, 114,957 tons in January three years ago, 106,002 tons in January four years ago, and 97,086 tons in January five years ago.

Based on the average for the past five years, January production of total newsprint was 10 per cent in excess of the monthly average while that of standard news was 11 per cent above an average.

Newsprint continues in a very strong market position. The movement into consuming channels is heavy, and despite the fact that manufacturers are running their plants at close to capacity output, they are finding a ready market for their production. As the pre-Easter shopping season draws near, publishers of newspapers are receiving a tremendous volume of advertising and are consequently called on to print large issues. It is becoming quite common for the New York daily papers to publish notices that "so many columns of advertising are omitted from this issue because of lack of space," thus reflecting the prosperous position of publishers at present. Moreover, circulation is growing, all of which leads to a big consumption of newsprint.

After having developed an easier tone, the market for box boards has firmed again. Toward the end of January demand for boards dropped off to a marked extent, this apparently being due partly to consumers having bought heavily for a time, and partly to the high prices prevailing effecting a drop in consumption, and for a period of three or four weeks' board quotations constantly receded, finally working down to as low as $55 a ton f. o. b. New York on plain chip and $60 on news board. Thereupon demand improved and prices strengthened, current quotations ranging around $60 on chip and $65 on news board. Prospects are for big business in boards during the next few weeks. The pre-Easter season is always one of the two busiest periods of the year for paper box manufacturers, and consumption of board should show steady increase during March, especially since prices have reacted to levels where consumers will not be so hesitant to absorb supplies.

There has been a general stiffening of prices on book paper. Mills are well provided with orders, both contract and transient, and a majority of manufacturers are sold up for some time ahead. Machine finished book is quoted at about 7 cents a pound f. o. b. New York, and coated book at from 9.50 cents per pound upwards. English finished is priced at a differential of about a quarter of a cent per pound above machine finished.

In spite of the strong competition afforded by imported kraft wrapping paper there is a good demand for domestic wrapping papers and prices rule firm. Tissues are livelier than in some time, especially white tissue which is being absorbed for the Easter holiday trade. Fine papers are firmly quoted. Rag bonds are particularly strong in price, reflecting the advances in raw material costs. Advances announced by mills, however, have invariably included sulphite bonds as well.

New Kraft Mill at Mosinee

Mr. O. Bache-Wiig of Mosinee, Wis., has formed a new company to be known as the Tomahawk Kraft Paper Company, associating with himself a number of capitalists and friends in Wausau, Milwaukee and Chicago.

The new properties at Tomahawk, Wis., will be taken over on April 1st by the new company, and while the organization of the new company has not as yet been perfected, yet we understand that Mr. Bache-Wiig is to be the president and guiding spirit.

The product of the new mill will be 40 tons a day of No. 1 Kraft paper, the marketing of which will be in the hands of Mr. George K. Gibson of Chicago.

Embargoes continue to hamper the New England ward shipment of paper from the west and embargoes at Portland terminal have delayed the movement of paper from northern Maine mills. Both these situations together with car and locomotive shortages show no immediate signs of abatement at this moment.

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Caustic Soda

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The location of the Diamond plants at Painesville, Ohio, where they are directly served by three trunk line railroads, assures a constant supply of these materials.

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No important changes have occurred in quotations. Producers are wisely holding up prices by turning out pulp only in sufficient volume to take care of their orders, and while buyers in certain cases are picking up bargain lots of pulp, no concerted movement of prices downward has developed. Bleached sulphite is quoted at between 4.50 and 5 cents per pound at pulp mills, depending on the quality of the pulp involved, and unbleached sulphite is selling at about 3 cents, with news grade fetching around 2.70 cents at producing plants. Kraft displays a relatively steadier tone than sulphite and is quoted at 3 to 3.25 cents per pound at shipping points for No. 1 quality kraft. Bleached soda pulp is holding in price at 4 to 4.25 cents a pound at pulp mills.

F. o. b. pulp mill quotations follow:

Bleached sulphite	4.50-5.00
Easy bleaching sulphite	3.00-3.25
Unbleached sulphite, No. 1	2.75-3.00
News grade sulphite	2.65-2.75
Soda pulp, bleached	4.00-4.25
Mitscherlich, unbleached	3.25-3.50
Kraft, No. 1	3.00-3.25
Screenings, refined	1.00-1.15

Mechanical Pulp

The most surprising development in mechanical wood pulp is that prices recently have declined slightly. Notwithstanding that news-print mills are operating at a brisk pace and are consuming ground wood in heavy tonnage, that board mills and other consumers have continued to use ground wood in comparatively large amounts, and that the statistical position of the market is strong indeed, prices of mechanical pulp have slid off a few dollars per ton until purchases down to $40 a ton at producing plants have been recorded in some cases. A more representative market level, however, is around $43 per ton at grinding plants. This is about the price a majority of domestic producers are quoting, and it is doubtful whether any sizable tonnage of prime pulp can be secured for prompt shipment at less than this figure.

The reason for the sagging tendency of prices presumably is that water conditions in grinding districts improved to a sufficient extent to enable grinders to increase their output, at least for a time, thus putting more pulp into the market. Furthermore, it is understood that some fair-sized shipments of ground wood have been received from European sources, which probably have had influence on the market. At any rate, consumption is keeping up at a high point, mill stocks are abnormally low, and the statistical position of the market is firm. As spring draws nearer prices may slide off further, but no one looks for any serious break in the market.

Chemicals

Casein is the strongest item in the papermaking chemicals market. This article is in limited supply; practically all of the stock now in this country is sold on contract, and importers are quoting high prices for forward deliveries. Up to 30 cents per pound has been mentioned as a level at which sales have been made, though nominal prices are in the neighborhood of 23 to 25 cents per pound. Bleaching powder is quotably steady at 1.85 to 2 cents a pound at works, caustic soda is quoted at 2.50 cents per pound for prompt delivery, soda ash at around 1.25 cents, and brimstone at $18 to $20 a ton at mines. Business in china clay is fairly active and prices are firm.

Average quotations are as follows:

Alum, lump ammonia	3.25- 3.50
Alum, lump starch	3.75- 4.00
Blanc fixe, powdered	4.00- 4.25
Bleaching powder	1.85- 2.00
Brimstone (long ton, at mine)	18.00-20.00
Casein (nominal)	23.00-25.00
Caustic soda, spot delivery	2.50- 2.75
China clay, domestic washed	12.00-15.00
China clay, foreign	15.00-22.00
Rosin, grade E	5.80- ...
Satin white	1.50- 1.75
Soda ash, 58 per cent light (bags)	1.20- 1.30
Starch, papermakers', in bags	2.82- ...
Talc (ton)	14.00-17.00

The Harris Paper Company, Inc., paper jobbers, of 31 East Tenth Street, New York, filed schedules in bankruptcy on February 26 showing liabilities of $114,168 and assets of $37,000, main items of which are unliquidated claims of $24,000, and stock and fixtures valued at $12,000. Some of the principal creditors are the American Writing Paper Company $9,081; the Crocker, McElwain Company, $7,287; the Berkshire Hills Paper Company, $10,430, and the Neenah Paper Company, $14,270.

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This volume of 178 pages is one of the most valuable contributions to the literature of pulp and paper manufacture yet issued. The contents include the following articles besides a directory of the officers and members of the Technical Association and the list of committees:

The Power Plant of the Paper Industry, by A. G. Darling and H. W. Rogers.
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Some Factors Influencing Yield and Strength of Pulp Cooked by the Soda Process, by Martin L. Griffin.
Sedimentation Control of Groundwood, by W. A. Munro.
The Efficient Production of Mechanical Pulp, by Adolph F. Meyer.
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Analysis of Reclaimed Cooking Acid for Sulphite Mills, by Gösta P. Genberg.
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Concerning Lignin and Lignin Reactions.
Contribution to the Knowledge of the Constitution of Spruce Wood Lignin.
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The Chemistry of the Sulphite Process, by R. N. Miller and W. H. Swanson.
Standard Methods of Testing Materials, by N. F. Becker.
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Sulphur in Sulphite Waste Liquor, by George Barsky.
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A New Idea in Chip Breaking, by A. D. Wood.
Fuel Economizers in Paper Mill Operations, by George E. Williamson and G. C. Derry.
A New Idea in Chip Breaking, by A. D. Wood.
Bibliography of Paper Making for 1921, by Clarence J. West.
Proceedings of the Annual Meeting, April, 1922.
Sectional Meeting on Dyestuffs.
Sectional Meeting on Paper Testing.
Sectional Meeting on the Drying of Paper.
Discussion of Various Papers Presented at the Convention.

The volume described is obtainable, on order, from the Technical Association of the Pulp and Paper Industry, 18 East 41st Street, New York City, at $3.00 per copy.

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No. 2 white, 24x36	.80- .90
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New Ground Wood Mill at Kenora

The new plant of the Backus-Brooks Company, at Kenora, Ontario, started operations March first.

From the power house the power is transmitted to the pulp mill sub-station over two double circuit three-phase feeders. The cables, twelve in all, are supported on steel towers, spaced 180 feet apart; the total length of transmission line being 4,000 feet. From the sub-station power is distributed to the various mill buildings. For the grinder motors the power is carried through at 2,200 volts to the grinder switchboard, while power for the other motors is carried from the sub-station, where the transformers are located, at 550 volts.

The pulpwood used at the mill will come from the Lake of the Woods through a log sluice into Rideout Bay. A conveyor will take the wood from the water to the slasher table. Here it will be cut into four foot lengths and then go into the barker. The bark is taken care of by going through a 20 inch Bark Press, and then being conveyed to the boiler house for use as fuel.

The barked wood is then conveyed to the storage room over the top of the magazine grinders, and here stored for use when the woodroom is not operating. There is sufficient room for enough wood to run the mill twenty-four hours at full capacity.

The grinder room is equipped with four Standard Magazine Grinders, built by the Waterous Engine Works, Brantford, Canada, and each pair driven by a 2,800 H. P. synchronous motor. The motor is directly connected to the two grinders, being situated between them, so that in case of repairs or replacement of stones being necessary, the grinder can be uncoupled and the other unit operated while repairs are being made.

The stock from the grinders flows by gravity to the bull screen. This screen is of the rotary outward flow type built by Hydrolic Machinery Co., Montreal. The slivers are discharged to a catch basin at one end of the screen, collected and put back into the magazine and reground. The accepted stock from the bull screen is then pumped to the flow box ahead of two Sherbrooke knotters, where any coarse slivers that the bull screen failed to remove, are taken out. The stock then goes through four Sherbrooke centrifugals, and the tailing from the centrifugals go to Sherbrooke tailers, and the accepted stock flows by gravity to the wet machine room.

The accepted stock from the tailers goes back to the bull screens, while the tailing from the knotters and tailers go to a Clafin refining engine to be reground. The system is entirely closed, and a one hundred percent yield from the wood is available. No slivers, whitewater, or stock in any form is allowed to go to waste. Whitewater is used throughout the mill except on the wet machine cylinders, and the wet machine felt showers. The fresh water used for pressure on the grinders discharges back into a suction tank, and is continually re-used.

The wet machine room is equipped with eight 84 inch Waterous Wet Machines, and two 86 inch machines built by Dominion Engineering Works, Montreal, Can., four 600-ton hydraulic presses, built by Southwark Foundry & Machine Co., Philadelphia. Two Nash vacuum pumps supply the vacuum for the wet machine vacuum boxes.

The mill was designed so that enlargement or future development could be very easily carried out without interfering with operation, or changing the present layout.

Testing for Rubber Latex in Paper

Unless the percentage of latex in a paper is quite large, it is not possible to detect it with certainty either by the smell on burning the paper, nor microscopically when examining the fibre composition after staining with Herzberg's Stain in the usual way. In the latter case, the latex may show as a material clotted on the fibres, which stains up yellow and tends to draw out in streaks.

If, however, the presence of latex is suspected or requires to be specially tested for, the following test is conclusive:

About 200 sq. cms. of the paper is torn into fairly small fragments, put in a small flask with a wide mouth, and covered with about 50 ccs. of chloroform.

It is allowed to stand for an hour with occasional shaking, and then gently warmed for 15 minutes—preferably on a water-bath—again with occasional shaking. The paper is then removed and the chloroform evaporated off till about 2-3 ccs. remains; this is now a solution of rubber and rosin, if these materials were present in the paper. Other substances will not be affected.

The solution is poured into a small test-tube (½"×6") and glacial acetic acid added (preferably warm) until a white cloud is produced, which persists on shaking. On allowing to stand, a coagulated precipitate of rubber forms if rubber is present in the paper. The rosin remains in solution. Viewed microscopically, the precipitate consists of globules, which flatten out when the coverslip of the slide is pressed, and which readily coalesce. The presence of a permanent precipitate, or cloud, if the amount of latex is very small, is sufficient, however, to prove the existence of latex in the paper.

The test can be made quantitative by taking a known weight of area of paper, and extracting twice with chloroform as above described—this may best be carried out in a flask fitted with a reflux condenser. The rubber, after precipitating with acetic acid and allowing to stand with occasional shaking until coagulated, is filtered off on silk gauze, washed with alcohol, dried and weighed.—*The Paper-Maker and British Paper Trade Journal.*

The Victoria Paper Mills, of Fulton, N. Y., have announced an increase in capital stock from $100,000 to $250,000.

"MICHIGAN" Combination Steel and Wood Pipe

LONG DISTANCE CONVEYOR OF WATER AND PAPER STOCK IN PAPER AND PULP MILLS—Specially Adapted to Carry Sulphite, Ground Wood and "White Water"

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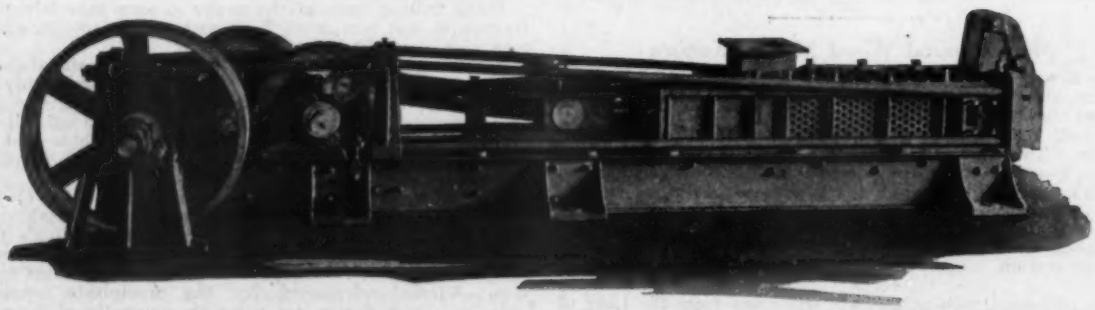

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Wood Pulp

The tone of the imported wood pulp market has undergone a stiffening process, due chiefly to the lockout in Swedish pulp mills and the consequent lack of production in that country. Importers in New York have displayed a distinctly stronger attitude and have in nearly all cases advanced quotations, especially on pulp for forward shipment from primary sources in Scandinavia during the approaching open-water season. No broad changes have occurred in prices of spot pulp but there is less inclination shown by holders to dispose of these supplies at other than what are regarded as representing full market prices, and in some instances quotations have been marked up a little.

The situation in Sweden is just about the same as a month ago. The lockout is continued and production of pulp by Swedish mills is practically at a standstill. There have been rumors during the past few days of a termination of the lockout, but in every case these have been found to be false, and latest advices from the other side of the Atlantic indicate that there is small likelihood of the difficulty being bridged over for another half month at least. A meeting has been set for March 15, at which the pulp mill proprietors will confer with representatives of their striking operatives, and it is possible that some agreement will be reached whereby the mill owners will decide to end the lockout. However, there are many in the trade who do not expect any definite outcome of this meeting, it being felt here that the questions at issue are of such moment that it will require a good deal of dickering before an agreement is reached.

In the meantime, shipments of pulp from Europe are arriving at American ports in considerable tonnage. February arrivals at New York were large, and it is understood proportionately as heavy imports were received at other American Atlantic ports, which infers that the lockout in Sweden is having little effect on the supply for the United States at present. The pulp now arriving, however, is against old orders principally and a good part of it is coming from other European sources than Sweden. Importers contend that stocks in Sweden are being rapidly depleted, and argue that the bullish point in the prevailing situation in that country is that the Swedes will not have their usual supplies for shipment to the American market and elsewhere when navigation over the Baltic is resumed, with the result that consumers depending on these spring supplies will necessarily have to look elsewhere to cover their wants, thus creating a stronger market.

Figures which the Department of Commerce has delayed in issuing because of the adoption of a new system of compiling import data inaugurated by Secretary Hoover show that importations of wood pulp into the United States were exceptionally large in October last, amounting to no less than 109,346 net tons of chemical pulp and 25,921 net tons of ground wood, constituting about the heaviest month's supply of imported pulp in a long time. October imports of chemical pulp, by way of comparison, were nearly twice as large as during the same month of 1921, when imports totaled 66,155 net tons.

There are still instances where importers are shading prices rather deeply in order to move spot lots of some kinds of pulp. This is particularly noticeable with regard to pulp arriving at Boston, at which port storage rates have been jumped to a level where it is more profitable for owners of incoming pulp shipments to knock off a few dollars per ton from the prices asked than to put the pulp in store. Because of this, paper manufacturers are now and then picking up a "cheap" quality of sulphite or kraft, but generally the price tone exhibits much strength and there is no such thing as price concessions allowed on future shipments of pulp. Importers quote between 3 and 3.25 cents per pound for No. 1 unbleached sulphite, while Scandinavian kraft is quoted at 3 cents and higher. Bleached sulphite holds at around 4.50 cents per pound ex dock for the No. 1 grade, and easy bleaching sulphite is quoted at 3.25 cents and more. Foreign ground wood is firm in spite of some fairly heavy arrivals, around $45 per ton on the dock being an average of quoted prices.

Receipts at the port of New York in February and current market quotations ex dock New York follow:

Bleached sulphite, No. 1	$ 4.25-$ 4.75
Unbleached sulphite, No. 1	3.00- 3.25
Easy bleaching	3.15- 3.40
Mitscherlich unbleached	3.00- 3.25
Kraft	2.80- 3.15
Ground wood, per ton	44.00- 46.00

A. J. Pagel & Co., 14,250 bls. from Gefle and 4,350 bls. from Harnosand; Castle & Overton, 3,000 bls. from Bremen, 440 bls. from Hamburg and 532 bls. from Gothenburg; Kidder, Peabody Acceptance Corp., 8,760 bls. from Bremen, 4,070 bls. from Gothenburg and 1,250 bls. from Namsos; Johaneson, Wales & Sparre, 2,117 bls. from Gothenburg and 7,204 bls. from Harnosand; Scandinavian-American Trading Co., 6,503 bls. from Gothenburg; American Woodpulp Corp., 300 bls. from Hamburg; Tidewater Paper Mills Co., 24,712 bls. ground wood from Liverpool, N. S.; M. Gottesman & Co., 1,800 bls. from Bremen, 1,200 bls. from Christiania, 1,250 bls. from Gothenburg and 900 bls. from Sundsvall; Nilsen, Lyon & Cc., 501 bls. from Bremen, 600 bls. from Christiania, 993 bls. from Antwerp and 1,594 bls. from Gothenburg; J. Anderson & Co., 1,560 bls. from Christiania; E. M. Sergeant & Co., 100 bls. from Christiania and 1,622 bls. from Gothenburg; H. Hollesen, 2,898 bls. from Hamburg; Woodpulp Trading Co., 12,795 bls. from Namsos; Seggerman Bros., 400 bls. from Gothenburg; Irving National Bank, 5,250 bls. from Gothenburg, 5,441 bls. from Kotka, 2,600 bls. from Helsingfors and 1,741 bls. from Mantyluoto; Mechanics & Metals National Bank, 1,000 bls. from Bremen; C. B. Richard & Co., 74 bls. from Hamburg; Brown Bros. & Co., 1,481 bls. from Hamburg and 9,525 bls. from Namsos; F. G. Prager & Co., 480 bls. from Bremen; E. Naumberg & Co., 3,000 bls. from Sundsvall; Robert Dollar Co., 2,040 bls. from Vancouver; Moore & McCormack, 1,546 bls. from Gothenburg; International Acceptance Bank, 500 bls. from Gothenburg; Chase National Bank, 46 bls. from Gothenburg; Whalen Pulp and Paper Co., 6,120 bls. from Vancouver; National City Bank, 800 bls. from Drammen and 2,400 bls. from Sundsvall; R. F. Hammond, 2,500 bls. from Gothenburg; Lagerloef Trading Co., 3 bls. from Helsingfors; Order, 2,115 bls. from Hamburg, 10,695 bls. from Sundsvall, 300 bls. from Copenhagen, 152 bls. from Bremen, 1,858 bls. from Helsingfors and 1,800 bls. from Harnosand.

Paper Stock

One of the main factors in keeping importations of papermaking materials into the United States within their present limits is the high prices which European dealers are demanding. Importers in New York say that there is a lively demand from paper mills but that shippers on the other side of the Atlantic are asking unreasonably high prices for their wares and that consequently they are frequently obliged to pass up offerings. At the same time imports are heavy. Certainly they are in excess of what was regarded as normal tonnage prior to the war, and there has been a marked increase during the past couple of months or since the market for papermaking materials stiffened following the lull in demand and the decline of prices shortly before the end of the year. A feature of current business in foreign papermaking stock is the imports of waste paper. This article has arrived in large amounts recently, chiefly from English sources, and paper and board mills are said to be showing preference for this material over domestic waste paper. Rags are coming in from Europe in good amounts, and imports of old rope and bagging are of fairly large volume.

Arrivals at the port of New York during February follow:

Old Rope

Brown Bros. & Co., 236 coils from Hull, 66 bls. from Rotterdam, 75 bls. from Copenhagen, 101 coils from Bremen, 66 coils from Newcastle and 129 coils from Antwerp; M. Wolfer & Co., 5 bls. from Havana; Stone Bros. & Victor Galaup Co., 43 bls. from Havre; Bemis Bro. Bag Co., 55 bls. from Barcelona and 80 coils from Christiania; W. H. Cummings & Son, 176 coils and 23 bls. from Copenhagen and 65 bls. from Havre; Yglesias & Co., 2 bls. from Havana; New York Trust Co., 120 coils from Hamburg; Mechanics & Metals National Bank, 21 coils from Hamburg and 116 bls. from Algiers; International Acceptance Bank, 93 coils from Bremen; Equitable Trust Co., 36 coils from Glasgow; Panama Railroad Co., 125 bls. from

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BLEACHED AND UNBLEACHED

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AGENTS FOR
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White Spruce
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Tonnages available on dock for prompt shipment
THE BORREGAARD CO., INC.
200 FIFTH AVENUE NEW YORK CITY

Cristobal; W. Schall & Co., 76 bls. from Barcelona and 152 coils from Newcastle; Ellerman Wilson S. S. Line, 155 coils from London; American Exchange National Bank, 87 coils from Hamburg; United Fruit Co., 7 bls. from Cristobal; Order, 5 bls. from Genoa and 385 bls. from Helsingfors.

Old Bagging

Irving National Bank, 74 bls. from Antwerp and 88 bls. from Manchester; Equitable Trust Co., 89 bls. from Antwerp and 190 bls. from Manchester; New York Trust Co., 71 bls. from Manchester; E. Butterworth & Co., 53 bls. from Rotterdam; Katzenstein & Keene, 58 bls. from Rotterdam; Order, 215 bls. from Glasgow and 254 bls. from Manchester.

Rags

American Woodpulp Corp., 45 bls. from Havre; E. J. Keller Co., 110 bls. from Havre and 119 bls. from Rotterdam; Katzenstein & Keene, 571 bls. from Havre, 34 bls. from London and 516 bls. from Rotterdam; M. Wolfer & Co., 10 bls. from Havana; Stone Bros. & Victor Galaup Co., 1,460 bls. from Havre and 88 bls. from Antwerp; Lavin & Rosenberg, 44 bls. from London; I. Abela & Co., 44 bls. from Trieste; M. Moran, 37 bls. from Liverpool; Albion Trading Co., 20 bls. from Liverpool; L. H. Abenheimer, 322 bls. from Havre; Meadows, Wye & Co., 447 bls. from Liverpool; R. F. Downing & Co., 62 bls. from Liverpool and 119 bls. from Manchester; Goldman, Sachs & Co., 424 bls. from Havre; Davies, Turner & Co., 270 bls. from Havre; Walford Forwarding Corp., 54 bls. from London; Mechanics & Metals National Bank, 34 bls. from Marseilles and 81 bls. from Manchester; Irving National Bank, 867 bls. from Marseilles and 81 bls. from Manchester; International Acceptance Bank, 221 bls. from Leith, 382 bls. from London, 122 bls. from Bremen and 29 bls. from Antwerp; Bank of America, 18 bls. from Rotterdam; Colombia Bank, 37 bls. from Havre; Jewish Colonial Trust Co., 205 bls. from London; Patterson National Bank, 24 bls. from London; Coal & Iron National Bank, 86 bls. from Glasgow; Maurice Frank & Co., 275 bls. from Rotterdam; Waste Material Trading Corp., 99 bls. from Rotterdam; S. Silberman Co., 85 bls. from Rotterdam; American Exchange National Bank, 43 bls. from Havre and 64 bls. from Rotterdam; National City Bank, 191 bls. from London; Alex Brown & Sons, 420 bls. from Havre; Chemical National Bank, 271 bls. from Bremen.

Miscellaneous Paper Stock

International Acceptance Bank, 294 bls. from Antwerp, 17 bls from London and 53 bls. from Liverpool; Irving National Bank, 1,792 bls. from Antwerp and 103 bls. from Hamburg; E. J. Keller Co., 240 bls. from Antwerp and 213 bls. from Rotterdam; Equitable Trust Co., 8 bls. from Dundee, 361 bls. from London and 60 bls. from Glasgow; Brown Bros. & Co., 265 bls. from London, 588 bls. from Glasgow, 285 bls. from Manchester and 100 bls. from Liverpool; L. H. Abenheimer, 114 bls. from Rotterdam; Cosmopolitan Shipping Co., 442 bls. from Rotterdam; London & Liverpool Bank of Commerce, 47 bls. from London; Order, 253 bls. from Hull, 95 bls. from Dundee, 63 bls. from Rotterdam, 75 bls. from Newcastle, 164 bls. from Belfast and 764 bls. from Dublin.

Paper

Continued heavy arrivals of kraft wrapping paper from Scandinavian and German sources was the feature of the United States' import trade in paper in February. Large shipments of wrapping paper were received, consigned to numerous concerns, while imports of news print were fairly heavy and those of cigarette, hanging, filter and other kinds of paper were up to normal. Receipts of paper of all kinds through the port of New York in February follow:

Cigarette

American Tobacco Co., 1,700 cs. from Bordeaux; P. J. Schweitzer, 72 cs. from Marseilles and 28 cs. from Southampton; R. J. Reynolds Tobacco Co., 680 bls. from St. Nazaire; M. Spiegel & Sons, 18 bls. from Genoa; J. V. Lago, 5 cs. from Allicante; Rose & Frank Co., 258 cs. from Havre; G. A. Henshaw & Sons, 121 cs. from Liverpool; Hard & Ritter, 45 cs. from Barcelona; De Manduit Paper Corp., 208 cs. from Havre; Standard Bank, 12 cs. from Havre; Southern Pacific Co., 3 cs. from Havre; United Fruit Co., 10 bls. from Barcelona; H .H. Strauss, 2 cs. from Havre; Order, 3 cs. from Marseilles.

Printing

W. F. Etherington & Son, 224 cs. from Glasgow; P. C. Zuhlke, 5 cs. from Rotterdam and 187 cs. from Antwerp; Pitt & Scott, 3 cs. from Hamburg; M. Gottesman & Co., 377 rolls

HANS LAGERLOEF, President and Treasurer
ORVAR HYLIN, Vice President
MAURICE LONDON, Secretary

TRADE HL MARK
REGISTERED

Lagerloef Trading Co., Inc.

52 Vanderbilt Avenue
NEW YORK, N. Y.

Telephones
Murray Hill { 4246 / 4247

WOOD PULP

SOLE AGENTS IN U. S. A., CANADA, MEXICO AND CUBA FOR

Finnish Cellulose Association
Helsingfors, Finland

AND

Finnish Wood Pulp Union
Helsingfors, Finland

BACK TO NORMALCY

Owing to substantial reductions in the cost of all materials entering into the construction of Jenssen Acid Towers, we are now building them at

NORMAL PRICES

Will YOU let us show YOU how to make MONEY by making a

BETTER ACID

Don't forget that every second sulphite mill on this continent is using our towers, so ask your neighbor what HE thinks of them.

G. D. JENSSEN CO.
200 5TH AVE. NEW YORK, N. Y.

When in need of penstock work, pressure or storage tanks, boilers and breechings, specify Manitowoc. This work receives the same careful attention as the construction of Manitowoc digesters, and cooking boilers. Plates are carefully shaped, accurately fitted and securely riveted—by experienced workmen.

Let us bid on your requirements

Manitowoc Engineering Works

Designers and builders of Disc Evaporators, Diffusers, Digesters, Cylindrical and Globe Rotary Cooking Boilers, Experimental Digesters, Paulson Barking Drums, Howard Refiners, Autoclaves, Incinerators, Wash Tanks, Causticizing Tanks, Blow-pipes, Bleach and Clay Mixtures, etc.

MANITOWOC, WISCONSIN

HYDRAULIC PRESSES

Pulp—Sulphite—Baling

PULP CARRYING TRUCKS

Pulp Press Details

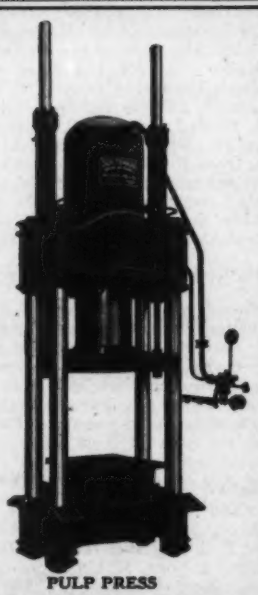
All steel construction except ram, which is chilled iron with ground working surface and outside packed.
Pressing table is 33" wide by 46" long.
Stroke of ram is 48".
Equipped with Southwark two pressure three-way valves for controlling.
Either single or two pressure systems available.
Provided with bottom pressing table and improved drop track which eliminates manual control.

Other Pulp and Paper Mill Equipment manufactured by Southwark.

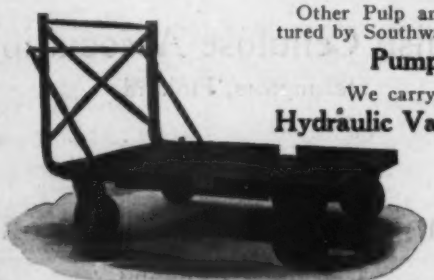
Pumps and Accumulators

We carry in stock a complete line of

Hydraulic Valves **Fittings and Pipe**



PULP PRESS



SOUTHWARK PULP CARRYING TRUCK

SOUTHWARK
FOUNDRY AND MACHINE CO.
ESTABLISHED 1836
PHILADELPHIA, PA.

Swetland Bldg., Cleveland 343 S. Dearborn St., Chicago

from Gothenburg; Newsprint Paper Corp., 30 rolls from Gothenburg; L. Schulman Co., 450 rolls from Bremen; D. C. Taggart, 314 rolls from Christiania and 2,143 rolls from Sundsvall; Perkins-Goodwin Co., 11 cs. from Genoa; Street & Smith Publishing Co., 803 rolls from Rotterdam; Oxford University Press, 7 cs. from Liverpool; B. F. Drakenfeld & Co., 18 cs. from Liverpool; G. G. Keferstein, 70 rolls from Hamburg; Globe Shipping Co., 189 cs. from Bremen; American Exchange National Bank, 93 rolls from Christiania; Irving National Bank, 171 cs. from Hamburg; Chemical National Bank, 308 rolls from Hamburg and 111 rolls from Rotterdam; Maurice O'Meara Co., 161 cs. from Antwerp; Remington Typewriter Co., 6 cs. from Antwerp; United States S. S. Lines, 110 rolls from Bremen; Equitable Trust Co., 45 rolls from Christiania; Great Eastern Paper Co., 208 rolls from Christiania; H. Reeve Angel & Co., 220 rolls from Bremen; J. B. Harris Paper Co., 115 rolls from Bremen; C. K. MacAlpine & Co., 44 rolls from Hamburg; Order, 15 bls. from Genoa, 519 rolls from Hull; 152 rolls from Dundee; 319 rolls from Christiania; 3,579 rolls from Hamburg; 694 rolls from Drammen, 4,302 rolls from Bremen and 127 rolls from Helsingfors.

Wrapping

Ladenburg, Thalman & Co., 1,892 bls. and 1,209 rolls from Hamburg; Fernstrom Paper Co., 229 bls. from Gothenburg, 8 bls. from Christiania and 26 bls. from Hamburg; Tradesmen's National Bank, 35 bls. from Gothenburg; Chatham & Phenix National Bank, 35 bls. from Gothenburg; Royal Mail Steam Packet Co., 390 rolls and 310 bls. from Hamburg; M. M. Cohen, 180 bls. and 98 rolls from Hamburg; Bendix Paper Co., 25 bls. from Hamburg; Bank of America, 174 rolls from Hamburg; J. P. Heffernan Paper Co., 213 bls. from Hamburg and 646 bls. from Gothenburg; Furness, Withy & Co., 99 rolls from Gothenburg; C. K. MacAlpine & Co., 95 rolls and 83 bls. from Gothenburg; Maurice O'Meara Co., 896 bls. from Gothenburg; Chemical National Bank, 229 rolls and 47 bls. from Gothenburg; Wilkinson Bros. & Co., 164 bls. from Gothenburg, 628 rolls and 124 bls. from Bergen, 155 bls. from Rotterdam, and 2,114 rolls and 849 bls. from Harnosand; T. Nevin, 5 cs. from London; International Acceptance Bank, 300 rolls and 306 bls. from Christiania; Tompkins & Co., 345 rolls and 12 bls. from Hamburg; Irving National Bank, 217 rolls from Hamburg; Mugler & Umlauf, 225 rolls and 66 bls. from Hamburg; Crepe, Kraft & Co., 52 rolls and 4 bls. from Hamburg; Chase National Bank, 72 rolls from Hamburg; W. Schall & Co., 198 rolls from Hamburg; H. Reeve Angel & Co., 2 cs. from Antwerp; M. Winters & Co., 2,074 rolls and 83 bls. from Gothenburg; Seggerman Bros., 267 rolls from Gothenburg; Bank of the U. S., 195 rolls from Gothenburg; American Exchange National Bank, 3,273 rolls from Hamburg; Kupfer Bros. Co., 186 rolls from Hamburg; J. B. Harris Paper Co., 11 rolls from San Juan; Fargo Trading Co., 188 bls. from Rotterdam; Birn & Wachenheim, 154 bls. from Rotterdam; Order, 1,110 rolls and 254 bls. from Hamburg, 626 rolls and 81 bls. from Gothenburg, 3,425 rolls and 395 bls. from Bremen, 120 rolls from Bergen, 2,704 rolls and 281 bls. from Harnosand, and 2,203 rolls from Rotterdam.

Writing

Irving National Bank, 16 cs. from Antwerp; Order, 6 cs. from Hamburg.

Drawing

Keuffel & Esser Co., 117 cs. from Hamburg; E. Dietzgen & Co., 17 cs. from Hamburg; Lunham & Moore, 1 cse. from London; M. G. Lange & Co., 11 cs. from Bremen; Favor, Ruhl & Co., 5 cs. from London; H. Reeve Angel & Co., 2 cs. from London; Order, 3 cs. from London.

Filter

C. D. Stone & Co., 3 cs. from Bremen; Fuerst Bros., 40 cs. from Hamburg; Bernard, Judae & Co., 6 cs. from Gothenburg; H. Reeve Angel & Co., 11 cs. from London; Magnus, Mabee & Reynard, 45 bls. from Bordeaux; M. Weiss & Co., 139 bls. from Bordeaux; J. Manheimer, 108 bls. from Southampton and 23 bls. from Havre; E. Fougera & Co., 81 cs. from Southampton; Lunham & Moore, 1 cse. from London.

Tissue

F. C. Strype, 28 cs. from Liverpool; Meadows, Wye & Co., 32 cs. from Liverpool; G. W. Sheldon & Co., 3 cs. from Liverpool; H. Reeve Angel & Co., 14 bls. from Helsingfors; Wilkinson Bros. & Co., 10 cs. from Liverpool.

Photo

Gevaert Co. of America, 81 cs. from Antwerp and 25 cs. from Hamburg.

Hercules Solves the Rosin Problem

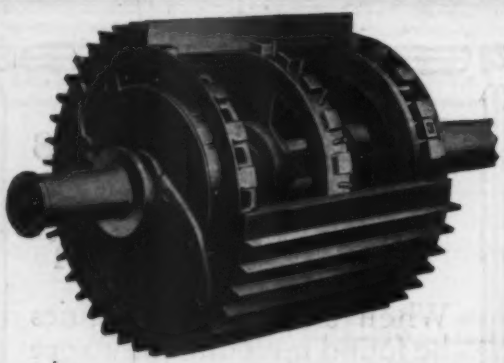
When asked what qualities he found most difficult to get in rosin, a paper manufacturer replied: "Cleanness and Uniformity." He now uses Hercules Wood Rosin, because it has assured him those qualities.

Hercules Wood Rosin is produced by a process which allows strict chemical control at every step. This insures its absolute freedom from dirt, sticks and other foreign substances. It enables us to make it uniform in color and quality. These points have made it a favorite with many paper manufacturers except in making the whitest papers.

If your requirements are of a special nature, our technical staff will be glad to co-operate with you.

HERCULES POWDER CO.
Wilmington Delaware
SALES OFFICES:
New York, N. Y. St. Louis, Mo.
Chicago, Ill. Louisville, Ky.
San Francisco, Calif. Buffalo, N. Y.
Chattanooga, Tenn. Duluth, Minn.
Birmingham, Ala.

HERCULES
Naval Stores
Produced Under Chemical Control

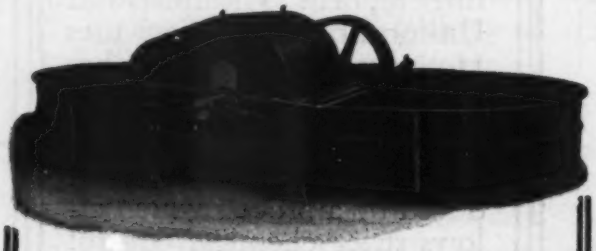


Dayton Globe Iron Works

DAYTON, O.

We manufacture Beating and Washing Engines, Head Gates, Hoists and Gears.

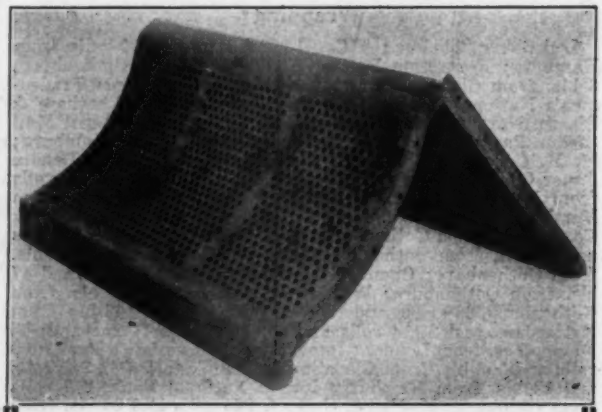
Our Wedge Type Bandless Roll made of semi-steel with special alloy bars is practically indestructible.



"Dayton" Beating Engines are Built for Heavy Duty

Dayton Beater and Hoist Co.

DAYTON, OHIO



Because there are no moving parts this is a very simple but very efficient device. Patent No. 1,271,426 issued to Mr. Brownell Buehler, July 2nd, 1918.

The Shartle Continuous Beater Company

MIDDLETOWN, OHIO

WYCKOFF WOOD PIPE

PRESSURE PIPE THAT NEVER BURSTS.
Built in sizes 1 inch to 48 inches.

The Paper Industry is successfully using thousands of feet of this Pipe and they find it to be the best conveyance for Paper Stock and Acids that can be obtained.

The Pipe of Service

DURABLE—ECONOMICAL—EASY TO INSTALL

Built of selected Canadian White Pine, Wyckoff Wood Pipe is wound with steel bands whose tensile strength is 58,000 to 65,000 lbs. per square inch. The experienced engineer selects a pipe of proven dependability. Wyckoff Wood Pipe, during the past 65 years, has built a reputation that stands the keenest competition. It has been, during this time, the choice of the largest pipe users in the world. We also manufacture a high grade underground steam pipe casing.

Write today for catalog and prices

A. Wyckoff & Son Company

1855 Elmira, N. Y., U. S. A. 1923

Hanging

A. C. Dodman Jr. & Co., 12 bls. from Liverpool, 28 bls. from Southampton and 26 bls. from Antwerp; M. J. Corbett & Co., 13 bls. from Hamburg; A. Murphy & Co., 28 bls. from Southampton, 14 bls. from Hamburg and 38 bls. from Liverpool; National City Bank, 1,594 bls. from Antwerp and 476 bls. from Bremen; F. G. Prager & Co., 2,757 rolls from Antwerp and 141 rolls from Hamburg; Judson Freight Forwarding Co., 7 cs. from Havre; W. H. S. Lloyd & Co., 157 bls. from London; R. F. Downing & Co., 54 bls. from London and 49 bls. from Yokohama; W. H. Kinnear, 2 cs. from Kobe; F. A. Binder, 35 bls. from Bremen; J. J. Hanken & Co., 2 bls. from Hamburg; F. Murray Hill Co., 6 bls. from Hamburg; Order, 68 bls. from Vancouver.

Board

Buschmann Bros., 805 rolls from Rotterdam; H. Fuchs & Son, 25 bls. from Gothenburg; Wiebush Calendar Importing Co., 40 cs. from Hamburg; F. G. Prager & Co., 82 cs. from Hamburg; Chase National Bank, 18 cs. from Gothenburg; Devoe & Raynolds Co., 3 cs. from London; Metropolitan Import & Mfg. Co., 97 cs. from Hamburg; Davies, Turner & Co., 4 cs. from Havre; D'Orsay, Inc., 14 cs. from Havre; Leunis & Co., 10 cs. from Bremen; Alpers & Mott, 10 cs. from Hamburg; Lindt Chocolate Co., 21 cs. from Rotterdam; Bendix Paper Co., 79 cs. from Hamburg.

Miscellaneous

Canson & Montgolfer, 2 cs. from Hamburg; K. Farrell & Son, 12 bls. from Hamburg; Coenca-Morrison Co., 66 cs. from Hamburg; A. W. Fenton, Inc., 127 cs. from Hamburg; P. H. Petry & Co., 27 cs. from Hamburg and 9 bls. from Havre; Birn & Wachenheim, 15 cs. from Havre and 100 bls. from Bremen; F. L. Kraemer & Co., 15 cs. from London; G. W. Sheldon & Co., 5 cs. from London; W. A. Foster & Co., 5 cs. from Hamburg; Richardson Bros., 14 cs. from Liverpool; Publicity Paper Corp., 2 cs. from Hamburg; Charles W. Rider & Co., 48 rolls from Hamburg; W. J. Byrnes & Co., 6 cs. from Havre; Whiting-Patterson Co., 20 cs. from Havre; Charles W. Williams & Co., 25 cs. from Antwerp; E. Daiber, 8 cs. from Antwerp; Favor, Ruhl & Co., 8 cs. from Southampton; A. Frankan & Co., 8 cs. from Bremen and 4 cs. from Hamburg; Steiner Paper Co., 5 cs. from Rotterdam; Borden & Riley Paper Co., 22 cs. from Antwerp; American Express Co., 15 bls. from Christiania; Tamm & Co., 6 cs. from Hamburg; Pelgram & Meyer, 18 cs. from Southampton; Parsons Trading Co., 24 cs. from Melbourne.

Foreign Trade Opportunities

Additional information regarding the following foreign trade opportunities issued by the Bureau of Foreign and Domestic Commerce of the United States Department of Commerce may be obtained from the Bureau in Washington, D. C., or its branch offices. It is requested that the number of the inquiry be given at all times.

No. 5244—Paper bottles and parchment and grease-proof paper. South Africa. Purchase and agency desired. Quotations c. i. f. Durban.

No. 5253—Print paper. Fiji Islands. Agency wanted.

No. 5284—Note and letter papers, plain and ruled, of all qualities and sizes suitable for private and business purposes; envelopes, printing and writing papers, packing and wrapping papers, and straw board. Ceylon. Purchase desired. Quotations c. i. f. Colombo. Samples and price lists requested.

No. 5302—Wood pulp for the manufacture of paper. Spain. Purchase and agency desired. Quotations c. i. f. Spanish port.

No. 5339—Roofing paper, single and two ply. China. Purchase desired. Quotations f. o. b. New York. To be delivered before June 15, 1923.

No. 5346—Vegetable parchment paper for creamery. South Africa. Purchase desired. Quotations f. o. b. New York. Samples desired.

No. 5415—News print, writing and book paper, and card board for cigarette boxes. Greece. Agency desired. Quotations c. i. f. Piraeus. Terms: Payment against documents. Correspondence, French.

No. 5430—Indurated fiber board, corrugated. Canada. Quotations f. o. b. shipping point.

No. 5442—Paper. Algeria. Purchase and agency desired. Quotations c. i. f. Algerian port.

The Paper Situation in Germany at the Beginning of 1923

The tariff commission of the book printing trade has again raised the wages of skilled printers, 18,000 marks for the first half of January and 21,000 marks for the second half. This is almost 1,000 times as much as in pre-war times. As a consequence the employers' society has raised the charges

FLY BARS
of BRONZE

Will outlast steel bars 5 to 1
Will not discolor paper stock
Are tougher and stronger than steel
Will not corrode
Will save money in operating costs
Tensile strength, 75,000 lbs. Yield Point, 38,000 lbs. Elongation, 20% in 2 in.

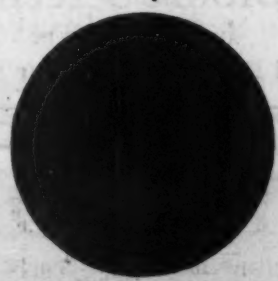
Hy-Ten-Sl Bronze Bars for Jordan Engine Fillers

Outwear anything on the market, by a wide margin.
This metal is as strong as Nickel Steel.
Tensile strength, 110,000 lbs. Yield point, 60,000 lbs. Elongation, 12% in 2 in.

AMERICAN MANGANESE BRONZE CO.
Holmesburg—Phila—Pa.
NEW YORK OFFICE: Room 806, 39 Pearl Street

Guaranteed Perfect
Draper Hollow Balanced Brass Balls
FOR STUFF PUMPS

Absolutely balanced; will not pound out of shape



Specify these when ordering new pumps.

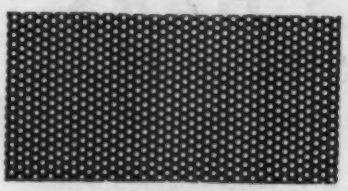
Order these to replace worn-out balls.

We make a specialty of repairing stuff pump balls.

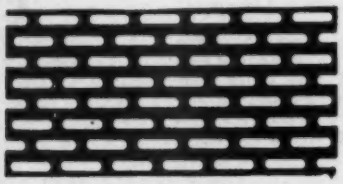
We also manufacture—
SOLID BRASS BALLS
IRON AND STEEL BALLS
BALL CHECK VALVES
VALVE FACING TOOLS

The Draper Manufacturing Co.
Port Huron, Mich. Petrolea, Canada
Every ball bears our registered trade-mark

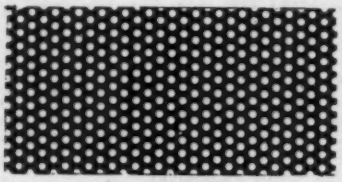
Perforated Metal Screens for Pulp and Paper Mills



.065 inch round



⅛ x ⅝" Slots



3/32 inch round

Steel, Copper, Brass, Bronze and other alloys punched for Centrifugal and Rotary Screens, Pulp Washers, Drainer Bottoms, Filter Plates, etc.

CHARLES MUNDT & SONS 57-65 Fairmount Avenue, Jersey City, N. J.

UNION SCREEN PLATE CO.

Fitchburg, Mass., U. S. A. Lennoxville, P. Q., Canada

UNION BRONZE SCREEN PLATES

(Best phosphorized Cast Metal)

Old Plates RECLOSED and RECUT to accurate gauge
UNION BRONZE SCREWS for Screen Plates
Immediate Delivery of the Largest Orders. Satisfaction Guaranteed

The Witham Screen Plate Fastener, Patented

THE ORIGINAL THE BEST

SCREEN PLATES *and* DANDY ROLLS

Watermarking a Specialty

Central Manufacturing Co.

The Quick Service House

KALAMAZOO MICHIGAN

Remember

WM. A. HARDY & SONS

FITCHBURG, MASS.

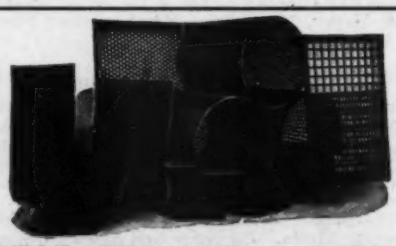
Originators and Oldest Manufacturers

OF THE

Cast Bronze Screen Plate

ALSO SPECIALIZE IN

Acid Resisting Digester Parts

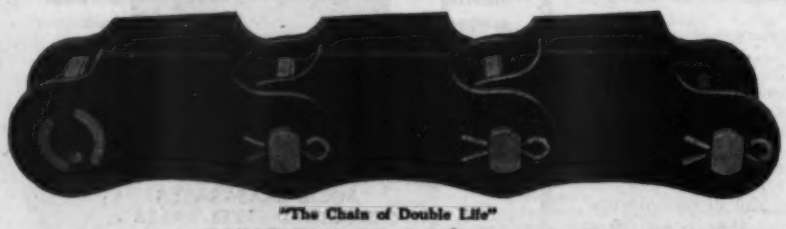


PERFORATED METAL SCREENS

in all metals for pulp and paper mills
Elevator Buckets (Plain and Perforated)
Conveyor Flights and Trough
General Sheet and Light Structural Work
Light and Heavy Steel Plate Construction
Write for perforated metal handbook

HENDRICK MFG. COMPANY

Main Office and Works 51 Dundaff Street Carbondale, Penna. | 30 Church Street New York City | 344 Union Arcade Building Pittsburgh, Penna.



"The Chain of Double Life"

Why Double Life?

When the pins and bushings in Union Steel Chains are considerably worn on the one side they can be turned half a revolution, thus bringing their unworn sides into service and practically renewing the chain; later they can be replaced with new wearing parts at small expense. Union Steel Chains invariably give longer service per dollar of cost; that's why they are used by the leaders in all industries.

UNION STEEL SPROCKET CHAINS

The chains with the substantial links and large case-hardened bearings. All sizes and capacities from one-inch pitch to 1,000,000 pounds ultimate strength.

Roller Chains; Bushing Chains; Elevator Chains; Conveyor Chains; Barking Drum Chains; Monel Metal Chains and Elevator Buckets; Cast Tooth Sprockets; Cut Tooth Sprockets; Renewable Tooth Sprockets; Elevating and Conveying Machinery

THE UNION CHAIN & MANUFACTURING COMPANY SANDUSKY, OHIO, U. S. A.

Registered UNION Trade Mark

for printing, and this means an increase in price of all books and newspapers. Many popular weeklies which sold in 1914 for a quarter of a mark, now fetch 250-300 marks per copy. Daily papers, trade journals and other periodicals are fast dying, among them are such which long ago celebrated their 50th birthday.

After tedious minute negotiations, the committee of the Imperial Minister of Economics two days before the year 1922 closed fixed the January price for printing paper at 560 marks, per kilogram against 445 in December, 1921. In this new price the increased price for coal which just now came into force is not included; the paper price will thus become actually higher as a clause of the coal agreement provides. On the state railways a lower tariff on printing paper has existed for some time, ranging from 20 to 30 per cent less. It is intended to make further reductions, but considering the exorbitant paper price it will not amount to much in the end.

In December the provision of coal for the paper mills was insufficient and difficulties arose.

The price of wood has reached an exorbitant height. In many cases, wood consumed by the mill was not replaced as the manufacturers refused to pay the high prices, thus raw material became scarce and the price for rags, waste paper, etc., rose greatly. Sometimes the world prices were surpassed so that certain makers have imported foreign waste paper. Accessory material also cannot be procured easily on account of excessive prices and severe conditions affecting payment. Corresponding with the good supply of water as a driving power the production of pulp was satisfactory. The demand for pulp, until recently keen, has diminished. The general activity of all works of the paper industry was not as good as in the past as the enormous increase of wages, raw materials, etc., raised the price of the finished product as it has never been raised before and the consumers exert a very great economy wherever possible. Envelopes are used twice, the blank backs of lettersheets, etc., are often used for correspondence, postcards are written instead of letters and much unnecessary correspondence is avoided. Of course the high postage which is now roughly 500 times for inland mail or almost 1,000 times for foreign mail compared with pre-war figures is another reason of this economy. Export business has also diminished since the German paper prices have been subjected to high export taxes and reach or surpass those on the world's market. The activity of the cardboard factories was generally lively, the plants have on hand a number of orders which gives them work for months to come.

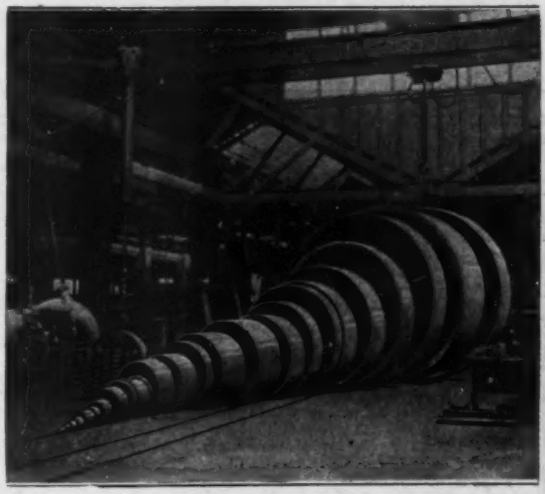
Situation of the Czechoslovakian Paper Industry

Germany has assumed, as is known, about 70 per cent of the factories of the duo-monarchy, Austria, and has extended them in many cases owing to what was at that time, a very favorable juncture. By the remarkable rise of the currency the paper industry which lives chiefly from the export was considerably hit. The present situation can best be called an actual catastrophe, for the foreign buyer if he is from Germany, Austria or Russia which countries have a low money standard, the Czech prices are still too high in spite of a discount granted him which is at times as high as 30 per cent. To this it must be added that other countries are keen competitors on the world market. Negotiations were made in some government departments without result. The manufacturers cannot drop the prices unless the State diminishes the various rates and taxes, especially the water tax which makes up to 2 to 3 per cent of the price of the finished product. Most factories in Czechoslovaky are driven by water power. Even the inland business is by no means good, as the demand little realizes the general crisis.

The Slovac factories which formerly exported nearly all their products to Hungary, Galizia and Roumania are obliged today, in spite of enormous freight charges, to find much of their market in the Sudeten countries; here they press on the prices. The present sales prices are below the self costs and many factories will be soon forced to close down. Their working capital will not stand the costly destructive continuance of running the works. Thus we can understand why one Slovac factory has attempted to transport its machinery to Hungary, an experiment which in most cases the government has stopped. The wholesale prices were, at the beginning of the present year, f. o. b. factory for every 100 kilogram paper without wood pulp, 750 to 850 Kronen, rotary news paper 355 to 365 Kronen, cellulose paper 350 to 400 Kronen, ordinary packing paper 225 to 300 Kronen, leather board 200 to 230 Kronen and grey cardboard 200 to 210 Kronen.

The Merriam Paper Company, New York City, has admitted to its membership certain who have heretofore been associated in a junior capacity.

A PULLEY
FOR EVERY PURPOSE



This will give you an idea of the wide range of sizes and styles of Cast Iron Pulleys that is constantly flowing through our shops.

Every one has been designed and will be used for some specific service—so you see they represent more than just "Pulleys."

Every article that goes to make up

The T. B. WOOD SONS CO. Line

of Power Transmission Machinery receives the same careful Engineering attention and can be furnished in the same wide variety of sizes and styles as the pulleys shown above.

Let us have an opportunity of figuring on your "Pulley Problems."

T. B. WOOD'S SONS CO.
CHAMBERSBURG, PA.

POWER TRANSMITTING MACHINERY

HAMILTON BOARD FELTS

Our style No. 82 top felt and style No. 87 bottom felt have the bulk of the filling threads on the face of the fabric. This style of weave causes the felts to give a smoother finish and longer service than can be secured from plain weave board felts besides shedding the water better. They do not "roll on the edge" and are billed at the same list and pound prices as our plain board felts.

SHULER & BENNINGHOFEN
Hamilton, Ohio

Fitchburg Duck Mills

ESTABLISHED 1841
FITCHBURG, MASS.
MANUFACTURERS OF
STANDARD AND MULTIPLE
DRYER FELTS

English Weave in Two, Three, Four, Five and Six Ply—60 Inches to 176 Inches in Width

Fine Faced Felts for Fine Papers. Absolutely no felt marks in paper. TRIBUNE Three Ply Felts for Coarse Papers.

LOCKPORT Felts

EXCLUSIVE MAKERS OF
Paper Makers' Felts

Have You Run Them?
If Not, Why Not?

Are You Interested in Accurate Running Felts?

Give Us a Trial
Get Authentic Information
Ask the Men Who Run Them

Yours for service
LOCKPORT FELT CO., Newfane, N. Y.

THE WATERBURY FELT CO.

SKANEATELES FALLS
New York

FELTS and JACKETS

Top and Bottom Wet Felts for board machines, with all the qualities requisite to insure long life and continuous production.

They Satisfy

STOWE & WOODWARD CO.

Newton Upper Falls, Mass.

Makers of Rubber Covered Rolls

Maximum Resiliency WITH Minimum Softness

Long Life

Buyers' Guide—What and Where to Buy

Equipment, Apparatus, Supplies and Raw Materials Used by the Paper Industry

ADHESIVES
E. F. Russ Co., Boston.
ACID RESISTING BRONZE
Eastwood Wire Mfg. Co., Belleville, N. J.
William A. Hardy & Sons, Fitchburg, Mass.
ACID RESISTING PAINT
Detroit Graphite Co., Detroit, Mich.
E. I. Du Pont de Nemours & Co., Wilmington, Del.
AGITATOR EQUIPMENT
Moore & White Co., Philadelphia.
AIR COMPRESSORS
Hooven, Owens, Rentschler Co., Hamilton, O.
AIR CONDITIONING AND CONTROL APPARATUS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
J. O. Ross Eng. Corp., New York City.
B. F. Sturtevant Co., Hyde Park, Boston.
ALKALI
Diamond Alkali Co., Pittsburgh.
Solvay Process Co., Syracuse, N. Y.
ANGLE VALVES
The Crane Company, Chicago.
Eastwood Wire Mfg. Co., Belleville, N. J.
ARCHITECTS
James L. Carey, Chicago.
Ferguson Engineers, Chicago.
Hardy S. Ferguson, New York City.
George F. Hardy, New York City.
V. D. Simons, Chicago.
Jos. H. Wallace & Co., New York City.
ASH CONVEYORS
Green Eng. Co., East Chicago, Ind.
ASSORTING TABLES
Moore and White Co., Philadelphia.
BAKELITE GEARS
D. O. James Mfg. Co., Chicago.
BALL CHECK VALVES
The Draper Mfg. Co., Port Huron, Mich.
BALLS (Brass)
The Draper Mfg. Co., Port Huron, Mich.
BALLS (Iron and Steel)
The Draper Mfg. Co., Port Huron, Mich.
BANDLESS ROLLS
Dayton Globe Iron Wks., Dayton, O.
Valley Iron Works Co., Appleton, Wis.
BARKERS
Holyoke Machine Co., Holyoke, Mass.
Union Iron Works, Bangor, Me.
Valley Iron Works Co., Appleton, Wis.
BEARINGS
The Falls Clutch & M. Co., Cuyahoga Falls, O.
The Hill Clutch Co., Cleveland, O.
T. B. Wood's Sons Co., Chambersburg, Pa.
BEARINGS (Ball)
S. K. F. Industries, New York City.
BEARINGS (Roller)
The Norma Co. of America, New York City.
BEATER BARS (Bronze)
American Manganese Bronze Co., Philadelphia.
BEATER ROLL FILING
Taylor Wharton Iron & Steel Co., Highbridge, N. J.
BEATING, WASHING AND BLEACHING ENGINES
American Voith Contact Co., New York City.
Dayton Beater & Hoist Co., Dayton, O.
Dayton Globe Iron Wks., Dayton, O.
Holyoke Machine Co., Holyoke, Mass.
Noble & Wood Machine Co., Hoosick Falls, N. Y.
Valley Iron Works Co., Appleton, Wis.
BEATERS (Centrifugal)
The Hermann Mfg. Co., Lancaster, O.
BELT DRIVES
The Falls Clutch & M. Co., Cuyahoga Falls, O.
The Link Belt Co., Chicago.
Morse Chain Co., Ithaca, N. Y.
T. B. Wood's Sons Co., Chambersburg, Pa.
BELT FASTENERS
Crescent Belt Fastener Co., New York City.
BELT LACING
Flexible Steel Lacing Co., Chicago.
BELTING (Balata)
Manheim Mfg. & Belting Co., Manheim, Pa.
BELTING (Rubber)
B. F. Goodrich Rubber Co., Akron, O.
The Republic Rubber Co., Youngstown, Ohio.
Voorhees Rubber Belt Co., Jersey City, N. J.
BELTING (Silent Chain)
Link Belt Co., Chicago.
Morse Chain Co., Ithaca, N. Y.
BLEACHING BOILERS
The Biggs Boiler Works Co., Akron, O.
BLEACHING POWDER
Pennsylvania Salt Mfg. Co., Philadelphia.
BLEACHING (Propellers)
Moore and White Co., Philadelphia.
BLEEDER TURBINE
Moore Steam Turbine Corp., Wellsville, N. Y.
BLOWERS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Clarage Fan Co., Kalamazoo, Mich.
Moore Steam Turbine Corp., Wellsville, N. Y.
J. O. Ross Eng. Corp., New York City.
BLOW-OFF VALVES
Henry Horkman, Neenah, Wis.
BOARD MACHINES
Beloit Iron Works, Beloit, Wis.
Black-Clawson Co., Hamilton, O.
Valley Iron Works, Appleton, Wis.
BOILERS
J. F. Davis, Chicago.
BOILERS (Electric)
Electric Furnace Con. Co., Philadelphia.
BRASS WIRE CLOTH
Appleton Wire Works, Appleton, Wis.
Cheney Bigelow Wire Works, Springfield, Mass.
Eastwood Wire Mfg. Co., Belleville, N. J.
Lindsay Wire Weaving Co., Cleveland, O.
W. S. Tyler Co., Cleveland, O.
BRICK AND CONCRETE PAINT
Detroit Graphite Co., Detroit, Mich.
BRIMSTONE
Union Sulphur Co., New York City.
BRONZE CASTINGS
Eastwood Wire Mfg. Co., Belleville, N. J.
BUCKETS (Elevator)
Hendricks Mfg. Co., Carbondale, Pa.
Robins Conveying Belt Co., New York City.
The Union Chain & Mfg. Co., Sandusky, O.
CALENDERS
Beloit Iron Works, Beloit, Wis.
Holyoke Machine Co., Holyoke, Mass.
Norwood Eng. Co., Florence, Mass.
Smith & Winchester Mfg. Co., So. Windham, Conn.
CALENDER DOCTORS
Ticonderoga Machine Works, Ticonderoga, N. Y.
CALENDER ROLLS
Holyoke Machine Co., Holyoke, Mass.
CASEIN
Casein Mfg. Co., New York City.
CASTINGS (Iron & Brass)
Smith & Winchester Mfg. Co., So. Windham, Conn.
CASTINGS (Brass and Bronze)
Eastwood Wire Mfg. Co., Belleville, N. J.
CASTINGS (Grey Iron)
Nordberg Mfg. Co., Milwaukee, Wis.
Robins Conveying Belt Co., New York City.
CAST IRON PIPE
American Cast Iron Pipe Co., Birmingham, Ala.
CAUSTIC SODA
Diamond Alkali Co., Pittsburgh.
Edw. Hill's Son & Co., New York City.
Solvay Process Co., Syracuse, N. Y.
CEMENT
Smith & Winchester Mfg. Co., So. Windham, Conn.
CEMENT PAINT
Detroit Graphite Co., Detroit, Mich.
CENTRIFUGAL PUMPS
American Steam Pump Co., Battle Creek, Mich.
E. M. Cross Mach. Co., Berlin, N. H.
Glens Falls Machine Works, Glens Falls, N. Y.
Ingersoll-Rand Co., New York City.
Valley Iron Works Co., Appleton, Wis.
CHAINS
The Union Chain & Mfg. Co., Sandusky, O.
CHAIN DRIVES
Link Belt Co., Chicago.
Morse Chain Co., Ithaca, N. Y.
The Union Chain & Mfg. Co., Sandusky, O.
CHAIN GRATES
Green Eng. Co., East Chicago, Ind.
CHEMICALS
Diamond Alkali Co., Pittsburgh.
E. I. Du Pont de Nemours & Co., Wilmington, Del.
Hercules Powder Co., New York City.
Merrimac Chemical Co., Boston.
Perkins-Goodwin Co., New York City.
Wing & Evans, Inc., New York City.
CHEMICAL STONEWARE
Maurice A. Knight, East Akron, O.
CHIPPERS
Holyoke Machine Co., Holyoke, Mass.
Union Iron Works, Bangor, Me.
Valley Iron Works Co., Appleton, Wis.
CLAYS AND FILLERS
Daniel M. Hicks, New York City.
CHLORINE (Liquid)
Mathieson Alkali Wks., Inc., New York City.
COAL BUNKERS
The Brownhoist Co., Cleveland, O.
COAL CRUSHERS
Orton & Steinbrenner Co., Chicago.
COAL & ASH HANDLING SYSTEMS
The Brown Hoisting Mach. Co., Cleveland, O.
Godfrey Conveyor Co., Elkhart, Ind.
Link Belt Co., Chicago.
COATED PAPERS
Watervliet Paper Co., Watervliet, Mich.
CONCRETE FLOOR HARDENER
Detroit Graphite Co., Detroit, Mich.
CONCRETE PAINT
Detroit Graphite Co., Detroit, Mich.
CONDENSERS
Nordberg Mfg. Co., Milwaukee, Wis.
CONSULTING ENGINEERS
James L. Carey, Chicago.
Hardy S. Ferguson, New York City.
Ferguson Engineers, Chicago.
George F. Hardy, New York City.
V. D. Simons, Chicago.
Jos. H. Wallace & Co., New York City.
CONSULTING ENGINEERS (Power)
B. M. Baxter, Cleveland.
Ferguson Engineers, Chicago.
V. D. Simons, Chicago.
CONTRACTORS (Building)
The Austin Co., Cleveland, O.
H. K. Ferguson Co., Cleveland, O.
CONVEYORS
The Brown Hoisting Mach. Co., Cleveland, O.
Godfrey Conveyor Co., Elkhart, Ind.
The Jeffrey Mfg. Co., Columbus, O.
Link Belt Co., Chicago.
Union Chain & Mfg. Co., Sandusky, O.
CONVEYORS (Belt)
Robins Conveying Belt Co., New York City.
CORDUROY WIRE CLOTH
The W. S. Tyler Co., Cleveland, O.
CORES (Collapsible)
Smith & Winchester Mfg. Co., So. Windham, Conn.
CORLISS ENGINES
Nordberg Mfg. Co., Milwaukee, Wis.
COUPLINGS
The Falls Clutch & M. Co., Cuyahoga Falls, O.
COUPLINGS (Shaft)
T. B. Wood's Sons Co., Chambersburg, Pa.
CRANES (Auto)
The Byers Mach. Co., Ravenna, O.
CRANES (Crawling Tractor)
The Brown Hoisting Mach. Co., Cleveland, O.
Industrial Works, Bay City, Mich.
CRANES (Dipper Arm)
Industrial Works, Bay City, Mich.
Orton & Steinbrenner Co., Chicago.
CRANES (Locomotive)
Brownhoist Co., Cleveland, O.
Link Belt Co., Chicago.
Industrial Works, Bay City, Mich.
McMyler Interstate Co., Bedford, O.
Orton & Steinbrenner Co., Chicago.
CRANES (Overhead)
Northern Engineering Works, Detroit, Mich.
CREOSOTING CYLINDERS
Biggs Boiler Works Co., Akron, O.
CRUSHERS (Coal and Coke)
Robins Conveying Belt Co., New York City.
CUTTERS
Smith & Winchester Mfg. Co., So. Windham, Conn.
CYLINDER MACHINES
Smith & Winchester Mfg. Co., So. Windham, Conn.
CYLINDER MOLDS (New or Repaired)
Appleton Wire Works, Appleton, Wis.
Beloit Iron Works, Beloit, Wis.
Cheney Bigelow Wire Works, Springfield, Mass.
Eastwood Wire Mfg. Co., Belleville, N. J.
Glens Falls Machine Works, Glens Falls, N. Y.
The Lindsay Wire Weaving Co., Cleveland, O.
The W. S. Tyler Co., Cleveland, O.
Wisconsin Wire Works, Appleton, Wis.
DANDY ROLLS
Appleton Wire Works, Appleton, Wis.
Central Mfg. Co., Kalamazoo, Mich.
Cheney Bigelow Wire Works, Springfield, Mass.
Eastwood Wire Mfg. Co., Belleville, N. J.
Lindsay Wire Weaving Co., Cleveland, O.
The W. S. Tyler Co., Cleveland, O.
DIE PRESSES
Smith & Winchester Mfg. Co., So. Windham, Conn.
DIESEL ENGINES
Nordberg Mfg. Co., Milwaukee, Wis.
DIGESTERS
The Biggs Boiler Works Co., Akron, O.
Chicago Bridge & Iron Wks., Chicago.
Manitowoc Eng. Works, Manitowoc, Wis.
DIGESTER COVERS
Eastwood Wire Mfg. Co., Belleville, N. J.
DRAINAGE SYSTEMS
The Fulton Engineering Co., Middletown, Ohio.
DRUM WINDERS (Drives)
Beloit Iron Works, Beloit, Wis.
Ticonderoga Machine Co., Ticonderoga, N. Y.
DRYERS
Smith & Winchester Mfg. Co., So. Windham, Conn.
DRYERS (Rotary)
Biggs Boiler Works Co., Akron, O.
DRYER EXHAUST
Nash Engineering Co., So. Norwalk, Conn.
DRYER FELTS
Appleton Woolen Co., Appleton, Wis.
Fitchburg Duck Mills, Fitchburg, Mass.
F. C. Huyck & Sons, Albany, N. Y.
Lockport Felt Co., Lockport, N. Y.
Shuler and Benningfield, Hamilton, O.
DRYING MACHINES
Drying Machine Corp. of Am., Inc., New York City.
DRYING SYSTEMS
J. O. Ross Eng. Corp., New York City.
DYESTUFFS
E. I. Du Pont de Nemours & Co., Wilmington, Del.
A. Klipstein and Co., New York City.
H. A. Metz & Co., Inc., New York City.
National Aniline & Chem. Co., New York City.
Standard Ultramarine Co., Huntington, W. Va.
Sandoz Chemical Works, New York City.
The White Tar Aniline Corp., New York City.
DUST COLLECTING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Clarage Fan Co., Kalamazoo, Mich.
ELECTRIC HOISTS
Link-Belt Co., Chicago.
Northern Engineering Co., Detroit, Mich.
ELECTRIC STEAM GENERATORS AND BOILERS
Electric Furnace Construction Co., Philadelphia.
ELECTRIC TRUCKS
The Elwell-Parker Electric Co., Cleveland, O.
ELECTRICAL MACHINERY
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa
ELEVATORS
The Brown Hoisting Mach. Co., Cleveland, O
Link Belt Co., Chicago.
The Union Chain & Mfg. Co., Sandusky, O.
ELEVATORS (Portable)
New Jersey Pdy. & Mach. Co., New York City.

The Sandy Hill Iron & Brass Works

Hudson Falls
New York

Manufacturers of **Paper and Pulp Mill Machinery**

BARRE GRANITE IN PRESS ROLLS

Is Revolutionizing the Whole Paper Making Industry

If your Paper Machines are not equipped with Press Rolls of BARRE GRANITE you are not getting the results that you should get, for it is a recognized fact that granite rolls are much superior to any others and Barre Granite the best of all. Let us tell you about them.

Jones Brothers Company

BARRE, VT. **BOSTON, MASS.**

Buyers' Guide—What and Where to Buy

Equipment, Apparatus, Supplies and Raw Materials Used by the Paper Industry

ENGINES
American Blower Co., Detroit, Mich.
Hooven, Owens, Rentschler Co., Hamilton, O.

ENGINES (Pumping)
Hooven, Owens, Rentschler Co., Hamilton, O.

ENGINES (Repairs)
Hooven, Owens, Rentschler Co., Hamilton, O.

ENGINES (Steam)
Hooven, Owens, Rentschler Co., Hamilton, O.

ENGINEERS
B. M. Baxter, Cleveland, O.
James L. Carey, Chicago.
George F. Hardy, New York City.
Hardy S. Ferguson, New York City.
Ferguson Engineers, Chicago.
Management Eng. & Dev. Co., Dayton, O.
V. D. Simons, Chicago.
Stebbins Engineering & Mfg. Co., Watertown, N. Y.
Jos. H. Wallace & Co., New York City.

ENGINEERS (Structural)
The Austin Co., Cleveland, O.
H. K. Ferguson Co., Cleveland, O.

EVAPORATORS
Swenson Evaporator Co., Chicago.

EXHAUSTERS
American Blower Co., Detroit, Mich.
Clarage Fan Co., Kalamazoo, Mich.
J. O. Ross Eng. Corp., New York City.

FANS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Clarage Fan Co., Kalamazoo, Mich.
J. O. Ross Eng. Corp., New York City.

FELTS AND JACKETS
Appleton Woolen Co., Appleton, Wis.
Fitchburg Duck Mills, Fitchburg, Mass.
F. C. Huyck & Sons, Albany, N. Y.
Lockport Felt Co., Newfane, N. Y.
Shuler and Benninghofen, Hamilton, O.
Waterbury Felt Co., Skaneateles Falls, N. Y.

FELT AND WIRE GUIDES
Moore & White Co., Philadelphia.

FILTER (Continuous Suction)
Oliver Continuous Filter Co., Los Angeles, Calif.

FILTERS (Pressure and Gravity)
Hungerford & Terry, Inc., Clayton, N. J.
Norwood Eng. Co., Florence, Mass.
The Permutit Co., New York City.

FLAT WALL PAINT
Detroit Graphite Co., Detroit, Mich.

FLOUR SACK MACHINERY
Smith & Winchester Mfg. Co., So. Windham, Conn.

FLOW METERS
Republic Flow Meters Co., Chicago.

FLUID METERS
Bailey Meter Co., Cleveland, O.

FLY BARS
Noble and Wood Mach. Co., Hoosick Falls, N. Y.

FOURDRINIER MACHINES
Smith & Winchester Mfg. Co., So. Windham, Conn.

FOURDRINIER WIRES
Appleton Wire Works, Appleton, Wis.
Cheney Bigelow Wire Works, Springfield, Mass.
Eastwood Wire Mfg. Co., Belleville, N. J.
Lindsay Wire Weaving Co., Cleveland, O.
The W. S. Tyler Co., Cleveland, O.
Wisconsin Wire Works, Appleton, Wis.

FRICTION CLUTCHES
The Falls Clutch & M. Co., Cuyahoga Falls, O.
Moore and White Co., Philadelphia.
T. B. Wood's Sons Co., Chambersburg, Pa.

GEARS
Cleveland Worm Gear Co., Cleveland, O.
The Falls Clutch & M. Co., Cuyahoga Falls, O.
Foote Bros. Gear & Machine Co., Chicago.
D. O. James Mfg. Co., Chicago.
Meisel Press Mfg. Co., Boston.
Robins Conveying Belt Co., New York City.

GEARS (Bakelite)
Foote Bros. Gear & Mach. Co., Chicago.

GEARS (Heavy Duty)
Foote Bros. Gear & Mach. Co., Chicago.
D. O. James Mfg. Co., Chicago.

GEARS (Rawhide)
Foote Bros. Gear & Mach. Co., Chicago.
D. O. James Mfg. Co., Chicago.

GEARS, REDUCTION
Moore Steam Turbine Corp., Wellsville, N. Y.

GEARS (Silent Chain)
Morse Chain Co., Ithaca, N. Y.

GEARS (Worm)
Cleveland Worm & Gear Co., Cleveland, O.

GENERATING SETS
Moore Steam Turbine Corp., Wellsville, N. Y.

GENERATORS (Turbo)
Moore Steam Turbine Corp., Wellsville, N. Y.

GLUES
E. F. Russ Co., Boston.

GRAB BUCKETS
The Brown Hoisting Mach. Co., Cleveland, O.
The Byers Mach. Co., Ravenna, O.
Industrial Works, Bay City, Mich.
Orton & Steinbrenner Co., Chicago

GRANITE ROLLS
Jones Bros. Co., Barre, Vt.

GREASE CUPS
The Falls Clutch & M. Co., Cuyahoga Falls, O.
Hunter Pressed Steel Co., Lansdale, Pa.

GRINDERS
Glens Falls Machine Works, Glens Falls, N. Y.
Holyoke Machine Co., Holyoke, Mass.
Nekoosa Motor & Mach. Co., Nekoosa, Wis.
Union Iron Works, Bangor, Me.
Valley Iron Works, Appleton, Wis.

GRINDSTONES
The Smallwood-Low Co., Lisbon, Ohio.

HAMMERS (Double Acting Steam Pile)
Industrial Works, Bay City, Mich.

HANGERS
The Falls Clutch & M. Co., Cuyahoga Falls, O.
T. B. Wood's Sons Co., Chambersburg, Pa.

HEAT RESISTING PAINTS
Detroit Graphite Co., Detroit, Mich.
The Franklin Paint Co., Cleveland, O.

HEATERS (Open Steam)
Biggs Boiler Works Co., Akron, O.

HEATING SYSTEMS
American Blower Co., Detroit, Mich.
J. O. Ross Engineering Corp., New York City.
Skinner Bros. Co., St. Louis, Mo.

HOISTS (Electric)
Northern Eng. Works, Detroit, Mich.

HOISTING AND CONVEYING SYSTEMS
The Brown Hoisting Mach. Co., Cleveland, O.
Link-Belt Co., Chicago.
Northern Engineering Co., Detroit, Mich.

HOSE
Voorhees Rubber Co., Jersey City, N. J.

HOISTING AND MONORAIL SYSTEMS
The Brown Hoisting Machine Co., Cleveland, O
Northern Eng. Works, Detroit, Mich.

HOUSE PAINT
Detroit Graphite Co., Detroit, Mich.

HYDRAULIC TURBINES
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Holyoke Machine Co., Holyoke, Mass.

IRON CASTINGS
Beloit Iron Works, Beloit, Wis.
Valley Iron Works Co., Appleton, Wis.

IRON FILLER
Detroit Graphite Co., Detroit, Mich.

IRON & STEEL SUPPLIES
Brown-Wales Co., Boston.

JORDAN ENGINES
Jones & Sons Co., E. D., Pittsfield, Mass.
Noble and Wood Mach. Co., Hoosick Falls, N. Y.
Smith & Winchester Mfg. Co., So. Windham, Conn.
Shartle Bros. Machine Co., Middletown, O.

JORDAN FILLINGS
Jones & Sons Co., E. D., Pittsfield, Mass.
Noble and Wood Mach. Co., Hoosick Falls, N. Y.
The Shartle Bros. Mach. Co., Middletown, O.
Taylor Wharton Iron & Steel Co., Highbridge, N. J.

JORDAN FILLINGS (Bronze)
American Manganese Bronze Co., Philadelphia.

KETTLES (Steam Jacketed)
The Biggs Boiler Works Co., Akron, O.

KNIVES
Simonds Saw and Steel Co., Fitchburg, Mass.

KRAFT AND SULPHATE PULPS
The Borregaard Co., Inc., New York City.

LABORATORY MACHINERY
Noble and Wood Mach. Co., Hoosick Falls, N. Y.

LAYBOYS
Moore and White Co., Philadelphia.

LIGHT REFLECTING PAINT
Detroit Graphite Co., Detroit, Mich.

LIQUID CHLORINE
Mathieson Alkali Works, Inc., New York City.

LUBRICATING GRAPHITE
Detroit Graphite Co., Detroit, Mich.

LUBRICATING GREASE
The Keystone Lubricating Co., Philadelphia.
Robins Conveying Belt Co., New York City.

MACHINE DRYER TEMP. CONTROL
Stickle Steam Specialties Co., Indianapolis, Ind.

MACHINE PAINTS
Detroit Graphite Co., Detroit, Mich.

MECHANICAL DRAFT APPARATUS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Clarage Fan Co., Kalamazoo, Mich.

MECHANICAL PULP
J. Andersen & Co., New York City.
The Borregaard Co., Inc., New York City.

MECHANICAL RUBBER GOODS
Voorhees Rubber Co., Jersey City, N. J.

METAL PROTECTING PAINTS
Detroit Graphite Co., Detroit, Mich.

MILL ARCHITECTS
Stebbins Engineering & Mfg. Co., Watertown, N. Y.

MILL WHITE
Detroit Graphite Co., Detroit, Mich.
E. I. Du Pont de Nemours & Co., Wilmington, Del.
U. S. Gutta Percha Co., Paintco, Providence, R. I.

NAVAL STORES
Hercules Powder Co., Wilmington, Del.

OIL CUPS
Hunter Pressed Steel Co., Lansdale, Pa.

OIL STORAGE SYSTEMS
Biggs Boiler Works Co., Akron, O.

PAINTS
Detroit Graphite Co., Detroit, Mich.
E. I. Du Pont de Nemours & Co., Wilmington, Del.
U. S. Gutta Percha Paint Co., Providence, R. I.

PAPER BAG MACHINERY
Smith & Winchester Mfg. Co., So. Windham, Conn.

PAPER BAG MANUFACTURERS
Union Bag & Paper Corp., New York City.

PAPER CUTTERS & SLITTERS
Beloit Iron Works, Beloit, Wis.
Hamblet Machine Co., Lawrence, Mass.
Meisel Press Mfg. Co., Boston, Mass.
Smith & Winchester Mfg. Co., South Windham, Conn.

PAPER DISTRIBUTERS
Becker Paper Corp., New York City.

PAPER EXPORTERS AND IMPORTERS
E. J. Keller Company, New York City.
Lagercief Trading Co., New York City.

PAPER MACHINES
Bagley & Sewall Co., Watertown, N. Y.
Beloit Iron Works, Beloit, Wis.
The Black-Clawson Co., Hamilton, O.
Smith & Winchester Mfg. Co., South Windham, Conn.
Valley Iron Works, Appleton, Wis.

PAPER MACHINE DRIVES
Harland Eng. Co., Montreal, Can.
Nordberg Mfg. Co., Milwaukee, Wis.
Westinghouse Elec. & Mach. Co., East Pittsburgh, Pa.

PAPER MANUFACTURERS
Eastern Manufacturing Co., New York City.
Hammermill Paper Co., Erie, Pa.
Marathon Paper Mills Co., Rothschild, Wis.
Munising Paper Co., Munising, Mich.
Nekoosa-Edwards Mfg. Co., Nekoosa, Wis.
Oxford Paper Co., New York City.
Watervliet Paper Co., Watervliet, Mich.
Wausau Sulphate Fibre Co., Mosinee, Wis.

PAPER MANUFACTURERS' SUPPLIES
J. Andersen & Co., New York City.
The Borregaard Co., Inc., New York City.
Diamond Alkali Co., Pittsburgh.
E. J. Keller Company, New York City.
Mendelson Bros. Paper Stock Co., Chicago.
Paper Trading Co., Boston.
Pennsylvania Salt Mfg. Co., Philadelphia.
Perkins-Goodwin Co., New York City.
H. B. Wadsworth, New York City.

PAPER STOCK CUTTERS
Taylor, Stiles & Co., Riegelsville, N. J.

PAPER TESTERS
Thwing Instrument Co., Philadelphia.

PARCHMENT MANUFACTURERS
Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.

PENSTOCKS
The Biggs Boiler Works Co., Akron, O.
Chicago Bridge & Iron Wks., Chicago.
Riter-Conley Co., Pittsburgh.

PERFORATED METALS
Hendrick Mfg. Co., Carbondale, Pa.
Charles Mundt & Sons, Jersey City, N. J.

PERFORATORS
Meisel Press Mfg. Co., Boston.

PILLOW BLOCKS
T. W. Wood's Sons Co., Chambersburg, Pa.

PILE DRIVERS
Industrial Works, Bay City, Mich.

PINIONS
Foote Bros. Gear & Mach. Co., Chicago.

PIPE JOINT CEMENT
Detroit Graphite Co., Detroit, Mich.

PIPE RIVETED STEEL
The Biggs Boiler Works, Akron, O.

PIPING EQUIPMENT
Pittsburgh Piping & Equip. Co., Pittsburgh.

PIPING SYSTEMS INSTALLED
Pittsburgh Piping & Equip. Co., Pittsburgh.

PIPE THREADING & CUTTING MACHINERY
Toledo Pipe Threading Machine Co., Toledo, O.

PNEUMATIC CHIP HANDLING SYSTEMS
Bayley Mfg. Co., Milwaukee, Wis.

POWER TRANSMISSION
The Carlyle Johnson Machine Co., Manchester, Conn
Dodge Mfg. Co., Mishawaka, Ind.
The Falls Clutch & M. Co., Cuyahoga Falls, O.
Link-Belt Co., Chicago.
D. O. James Mfg. Co., Chicago.
The Union Chain & Mfg. Co., Sandusky, O.
Valley Iron Works, Williamsport, Pa.
T. B. Wood's Sons Co., Chambersburg, Pa.

PRESERVATIVE PAINTS
Detroit Graphite Co., Detroit, Mich.

PRINTING PRESSES
Meisel Press Mfg. Co., Boston.

PULLEYS
The Falls Clutch & M. Co., Cuyahoga Falls, O
T. B. Wood's Sons Co., Chambersburg, Pa.

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The Borregaard Co., Inc., New York City.

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Reversible flat and roller platform
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Quick speed lowering device
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Ability to lower on hoisting spindle as well as quick speed
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Rugged construction throughout

Electric machines have regular hoist type motor, line switch, reversing controller, upper and lower limits, heavy silent chain drive.

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Giving the Beater a Lift

The operation of a beater, with its wear and tear and tremendous power consumption, has one primary purpose, namely, hydration. Any thing that will economically bring about hydration more quickly relieves the beater just that much, cuts down on operating costs and speeds the process of paper making.

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The Pulp & Paper Trading Co., New York City.

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Beloit Iron Works, Beloit, Wis.
The Biggs Boiler Works Co., Akron, O.
The Black-Clawson Co., Hamilton, Ohio.
Carthage Mach. Co., Carthage, N. Y.
Davis, Frank H., Cambridge, Mass.
Dominion Engineering Works, Ltd., Montreal, Canada.
Downingtown Mfg. Co., E. Downingtown, Pa.
Glens Falls Machine Works, Glens Falls, N. Y.
Improved Paper Machinery Co., Nashua, N. H.
Moore & White Co., Philadelphia.
Nashville Industrial Corp., Jacksonville, Tenn.
Nekoosa Motor & Mach. Co., Nekoosa, Wis.
Noble & Woods Machine Co., Hoosick Falls, N. Y.
Sandusky Fdy. & Mach. Co., Sandusky, O.
The Sandy Hill Iron & Brass Works, Hudson Falls, N. Y.
Union Iron Works, Bangor, Me.
Valley Iron Works, Appleton, Wis.
Western Marine & Salvage Co., Alexandria, Va.

PULP GRINDERS
Glens Falls Machine Works, Glens Falls, N. Y.
Nekoosa Motor & Mach. Co., Nekoosa, Wis.
Union Iron Works, Bangor, Me.

PULP PRESSES
Southwork Foundry & Machine Co., Philadelphia.

PULP STONES
Smallwood-Low Stone Co., Lisbon, O.

PUMPS (Boiler Feed)
Moore Steam Turbine Corp., Wellsville, N. Y.
The Goulds Mfg. Co., Seneca Falls, N. Y.
Taber Pump Co., Buffalo, N. Y.

PUMPING MACHINERY
Hooven, Owens, Rentschler Co., Hamilton, O.

PUMPS (Steam)
Beloit Iron Works, Beloit, Wis.
Glens Falls Machine Works, Glens Falls, N. Y.
The Goulds Mfg. Co., Seneca Falls, N. Y.
Gregg Pump Co., Kansas City, Mo.
Smith & Winchester Mfg. Co., So. Windham, Conn.
Taber Pump Co., Buffalo, N. Y.

PUMPS (Centrifugal)
American Steam Pump Co., Battle Creek, Mich.
Aurora Pump & Mfg. Co., Aurora, Ill.
Cross, E. M., Mach. Co., Berlin, N. H.
DeLaval Steam Pump Co., Trenton, N. J.
Fairbanks, Morse & Co., Chicago.
The Goulds Mfg. Co., Seneca Falls, N. Y.
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Smith & Winchester Mfg. Co., So. Windham, Conn.
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Aurora Pump & Mfg. Co., Aurora, Ill.
A. D. Cook & Co., Inc., Lawrenceburg, Ind.
Gregg Pump Co., Kansas City, Mo.
The Goulds Mfg. Co., Seneca Falls, N. Y.
Taber Pump Co., Buffalo, N. Y.

PUMPS, TURBINE
Moore Steam Turbine Corp., Wellsville, N. Y.

PUMPS (Vacuum)
American Steam Pump Co., Battle Creek, Mich.
E. M. Cross Mach. Co., Berlin, N. H.
The Goulds Mfg. Co., Seneca Falls, N. Y.
Nash Eng. Co., South Norwalk, Conn.
Taber Pump Co., Buffalo, N. Y.

RAG AND PAPER DUSTERS
Holyoke Machine Co, Holyoke, Mass.
Norwood Eng. Co., Florence, Mass.

RECLAIMING MACHINERY
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REDUCTION GEARS
Moore Steam Turbine Corp., Wellsville, N. Y.

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Smith & Winchester Mfg. Co., So. Windham, Conn.

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Ryther & Pringle Co., Carthage, N. Y.

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B. F. Goodrich Co., Akron, Ohio.
Rodney Hunt Machine Co., Orange, Mass.
Stowe & Woodward Co., Upper Newton Falls, Mass.

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American Blower Co., Detroit, Mich.
Clarage Fan Co., Kalamazoo, Mich.
J. O. Ross Eng. Corp., New York City.

ROOF PAINT
Detroit Graphite Co., Detroit, Mich.

ROPE DRIVES
The Falls Clutch & M. Co., Cuyahoga Falls, O.
Dodge Mfg. Co., Mishawaka, Ind.
T. B. Wood's Sons Co., Chambersburg, Pa.

ROTARY BLEACHING BOILERS
The Biggs Boiler Works Co., Akron, O.

ROZIN
Hercules Powder Co., Wilmington, Del.

RUST RESISTING PAINT
Detroit Graphite Co., Detroit, Mich.

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Voorhees Rubber Mfg. Co., Jersey City, N. J.

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American Voith Contact Co., New York City.
Glens Falls Machine Works, Glens Falls, N. Y.

SAWS
Simonds Mfg. Co., Fitchburg, Mass.

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The Bagley & Sewall Co., Watertown, N. Y.
Union Iron Works, Bangor, Me.

SCREENS (Perforated Metal)
Hendrick Mfg. Co., Carbondale, Pa.
Charles Mundt & Sons, Jersey City, N. J.

SCREENS (Woven Wire)
The W. S. Tyler Co., Cleveland, O.

SCREEN PLATES
Central Mfg. Co., Kalamazoo, Mich.
William A. Hardy & Sons, Fitchburg, Mass.
Union Screen Plate Co., Fitchburg, Mass.

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The Falls Clutch & M. Co., Cuyahoga Falls, O.
T. B. Wood's Sons Co., Chambersburg, Pa.

SHOWER PIPES
Smith & Winchester Mfg. Co., So. Windham, Conn.

SHREDDERS
The Jeffrey Mfg. Co., Columbus, O.
Mitts & Merrill, Saginaw, Mich.

SILENT CHAIN DRIVES
The Link Belt Co., Chicago.
Morse Chain Co., Ithaca, N. Y.

SIZE
Western Paper Makers' Chemical Co., Kalamazoo, Mich.

SLITTING AND REWINDING MACHINERY
American Voith Contact Co., New York City.
Beloit Iron Works, Beloit, Wis.
Cameron Machine Co., Brooklyn, N. Y.
Hamblet Machine Co., Lawrence, Mass.
Meisel Press Mfg. Co., Boston.
Samuel M. Langston Co., Camden, N. J.

SOOT BLOWERS
Diamond Power Specialty Corporation, Detroit, Mich.

SODA ASH
Diamond Alkali Co., Pittsburgh.
Edw. Hill's Son & Co., New York City.
Solvay Process Co., Syracuse, N. Y.

SPECIAL MACHINERY
Nordberg Mfg. Co., Milwaukee, Wis.

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Moore and White Co., Philadelphia.

SPEED REDUCERS
Foote Bros. Gear & Machine Co., Chicago.
D. O. James Mfg. Co., Chicago.
W. A. Jones Fdy. & Mach. Co., Chicago.

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Foote Bros. Gear & Machine Co., Chicago.
D. O. James Mfg. Co., Chicago
W. A. Jones Fdy. & Mach. Co., Chicago.

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D. O. James Mfg. Co., Chicago.

SPROCKETS
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Morse Chain Co., Ithaca, N. Y.

STEAM GENERATORS (Electric)
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STEAM REGULATORS (For Dryers)
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The Fulton Engineering Co., Middletown, Ohio.

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Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Terry Steam Turbine Co., Hartford, Conn.

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Hendrick Mfg. Co., Carbondale, Pa.
Riter-Conley Co., Pittsburgh.

STOCK CIRCULATING SYSTEM
The Hermann Mfg. Co., Lancaster, O.
Ticonderoga Machine Works, Ticonderoga, N. Y.

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Beloit Iron Works, Beloit, Wis.

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Riter-Conley Co., Pittsburgh.

STRAINERS
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STRUCTURE STEEL PAINT
Detroit Graphite Co., Detroit, Mich.

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Noble and Wood Mach. Co., Hoosick Falls, N. Y.

STUFF PUMPS
Noble and Wood Mach. Co., Hoosick Falls, N. Y.
De Laval Steam Pump Co., Trenton, N. J.

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Union Sulphur Co., New York City.

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Valley Iron Works Co., Appleton, Wis.

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TANKS (Oil)
Biggs Boiler Works Co., Akron, O.

TANKS (Paint)
Biggs Boiler Works Co., Akron, O.

TANKS (Jacketed)
Biggs Boiler Works Co., Akron, O.

TANKS (Wooden)
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E. F. Schlichter Co., Philadelphia, Pa.
Stevens Tank & Tower Co., Auburn, Me.

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TANKS AND TOWERS
Stevens Tank & Tower Co., Auburn, Me.

TOWERS (Loading and Unloading)
Robins Conveying Belt Co., New York City.

TRANSMISSION MACHINERY
Dodge Mfg. Co., Mishawaka, Ind.
Foote Bros. Gear & Mach. Co., Chicago.
T. B. Wood's Sons Co., Chambersburg, Pa.
D. O. James Mfg. Co, Chicago

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Moore Steam Turbine Corp., Wellsville, N. Y.
Terry Steam Turbine Co., Hartford, Conn.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

TURBINES (Hydraulic)
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Holyoke Machine Co., Holyoke, Mass.

UNIFLOW ENGINES
Nordberg Mfg. Co., Milwaukee, Wis.

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T. H. Savery, Jr., Chicago.

VACUUM SYSTEMS
Stickle Steam Specialties Co., Indianapolis, Ind.

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The Draper Mfg. Co., Port Huron, Mich.

VALVES
The Crane Co., Chicago.
G. M. Davis Regulator Co., Chicago.
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The Wm. Powell Co., Cincinnati.
Reading Steel Casting Co., Inc., Bridgeport, Conn.

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Hooven, Owens, Rentschler Co., Hamilton, O.

VALVES (Digester)
Eastwood Wire Mfg. Co., Belleville, N. J.

VALVES (Throttle)
Hooven, Owens, Rentschler Co., Hamilton, O.

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Bayley Mfg. Co., Milwaukee, Wis.
Clarage Fan Co., Kalamazoo, Mich.
J. O. Ross Engineering Corp., New York City.

VATS (Steel)
The Biggs Boiler Works Co., Akron, O.

VENTILATING SYSTEMS
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Arex Company, Chicago.
Bayley Mfg. Co., Milwaukee, Wis.
Clarage Fan Co., Kalamazoo, Mich.
J. O. Ross Engineering Corp., New York City.

VULCANIZERS
Biggs Boiler Works Co., Akron, O.

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Eastwood Wire Mfg. Co., Belleville, N. J.
The W. S. Tyler Co., Cleveland, O.
Wisconsin Wire Works, Appleton, Wis.

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Mendelson Bros. Paper Stock Co., Chicago.

WATER FILTER
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Hungerford & Terry, Inc., Clayton, N. Y.

WATER-SOFTENING AND PURIFYING SYSTEMS
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The Permutit Co., New York City.
Wm. B. Scaife and Sons Co., Oakmont, Pa.

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Holyoke Machine Co., Holyoke, Mass.
The James Leffel and Co., Springfield, Ohio.

WET MACHINES
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Valley Iron Works Co., Appleton, Wis.
Smith & Winchester Mfg. Co., So. Windham, Conn.

WHEELS (Sprocket)
Robins Conveying Belt Co., New York City.

WOOD GRAPPLES
Industrial Works, Bay City, Mich.

WOOD PIPE
The Michigan Pipe Co., Bay City, Mich.
A. Wyckoff & Son Co., Elmira, N. Y.

WOOD PRESERVATIVES
Detroit Graphite Co., Detroit, Mich.

WORM DRIVES
Cleveland Worm & Gear Co., Cleveland, O.

WORM GEARS
Foote Bros. Gear & Mach. Co., Chicago.

WIRE SIGNS
Cheney Bigelow Wire Works, Springfield, Mass.

CHEMICAL STONEWARE

Packing: For Absorption, Condensing, Drying or Neutralizing Towers

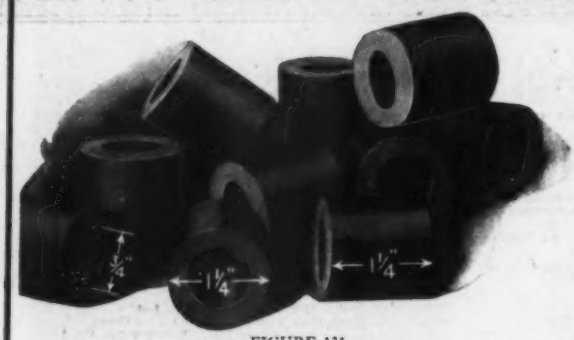

FIGURE 134
SMALL TUBE TOWER PACKING

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FIGURE 132
ACID PROOF PARTITION RINGS

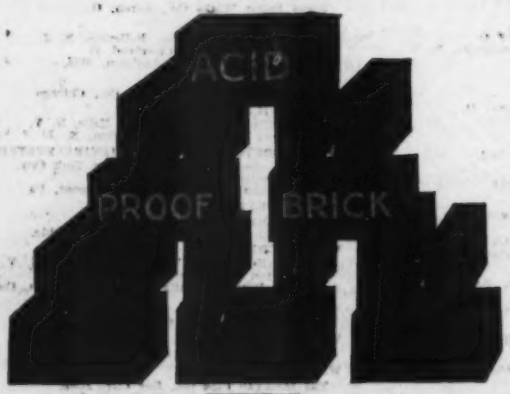

FIGURE 130
ACID PROOF VITRIFIED BRICK

SMALL TUBE, TOWER PACKING, No. 134.

One size only shown on illustration—we make four standard sizes as listed below, and made either with a glazed, or an unglazed body as you prefer, in either case the rings being acid proof throughout the entire body. Also made in sizes to suit your needs.

⅝" long, ⅝" diameter, ⅜" hole.	All
¾" long, ¾" diameter, ⅜" hole.	Carried
1 " long, 1 " diameter, ⅝" hole.	in
1¼" long, 1¼" diameter, ¾" hole.	Stock

Used as entire packing for small bore towers, or at top of large towers on large packing for more even distribution of the liquor over packing, etc. A good, reasonable priced, and efficient tower packing. Will stand considerable compression and the severe conditions encountered in chemical towers. Packed in barrels for L.C.L. shipment—or loose for carload shipments. Samples gladly furnished. State if wanted glazed or unglazed—quantity—size.

ACID PROOF CHEMICAL STONEWARE CURVED PARTITION RINGS. CARRIED IN STOCK. FIGURE 132.

Are made in three standard sizes.

Sizes	6"x6"	6"x4"	4"x3"
Weight each, pounds	8	5½	2½
Number to a cubic foot	8	12	36
Minimum carload	6,250	10,000	20,000
Number to a barrel	30	46	100
TOWERS:			
To a 24" x 24" section	45	70	175
To a 30" x 24" section	75	115	360
To a 36" x 24" section	110	160	415
To a 40" x 24" section	130	325	620

We also make these rings plain without partitions.

It is usual practice in packing a tower with these rings to use the 6" x 6" for the bottom ⅓, the 6" x 4" for the center ⅓ and the 4" x 3" for the top ⅓—the smaller packing being at the top where the gases occupy less room due to cooling and absorption. This packing will not clog or channel.

ACID PROOF VITRIFIED BRICK FIGURE 130 FOR PACKING LARGE TOWERS

Standard size: 8" x 4" x 2½". Carried in stock.
Weight, about 5¾ pounds each.
Minimum carload, 10,000 brick.
Packed in barrels for L.C.L. shipments.

This is a molded, not sawed, brick, repressed under two tons pressure. Is made of the same clays and fired in the same kilns and at the same time as our chemical stoneware apparatus. They have a tough and impervious body, are salt glazed, and are ACID PROOF THROUGHOUT THE ENTIRE BODY.

Used as checkerwork packing in large sulphuric acid and similar towers. We have made these brick for over 18 years and sold them to all parts of the world.

18—MAURICE A. KNIGHT Office and Factory Kelly Avenue **Akron, Ohio—Years**

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Pulp & Paper Trading Co. 1754

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Terry Steam Turbine Co., The. 1649
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Ticonderoga Machine Works. 1724
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Tyler Company, The W. S. 1729

Union Bag & Paper Corp. 1635
Union Chain & Mfg. Co. 1760
Union Iron Works. 1628
Union Screen Plate Co. 1760
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U. S. Gutta Percha Paint Co. 1708

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Wallace & Co., Jos. H. 1742
Wadsworth, H. B. 1742
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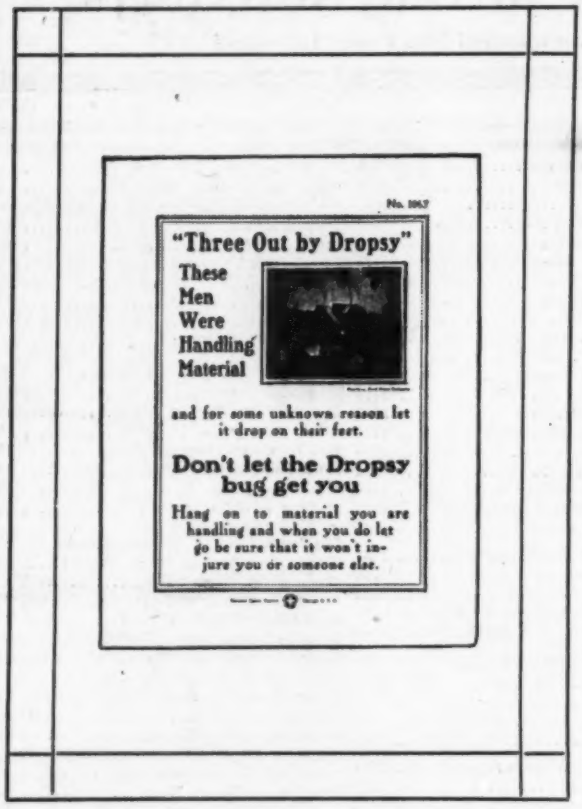
White Tar Aniline Corp., The. 1746
Wisconsin Wire Works. 1627
Wood's Sons Co., T. B. 1760
Wyckoff & Son Co., A. 1758


No. 1067
"Three Out by Dropsy"
These Men Were Handling Material
and for some unknown reason let it drop on their feet.
Don't let the Dropsy bug get you
Hang on to material you are handling and when you do let go be sure that it won't injure you or someone else.

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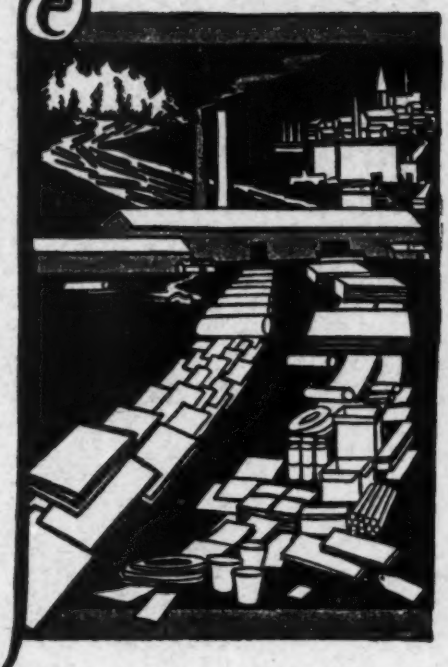
PAPER INDUSTRIES EXPOSITION

GRAND CENTRAL PALACE

NEW YORK

Week of APRIL 9th 1923



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MANUFACTURERS of paper making machinery and supplies will demonstrate new inventions and describe modern methods and processes designed to enable paper makers to lower their production costs.

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It is likely that not only will your best customers be at the Exposition, but many of your best prospective customers too. What are you going to say to them? Are you going to maintain your leadership by an active participation, or are you going to let your customers wonder where you are?

This is a good time to stop and think what it means to you to be represented at the Exposition. And remember that April 9th to 14th is Convention Week in New York for the American Paper & Pulp Association and the N. P. T. A.

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Ask us to send you a diagram and costs of the exhibit spaces still available. There are only a few spaces for your selection, but these are attractively located and should interest you.

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Grand Central Palace Management International Exposition Company **New York City**

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BRASS | CYLINDER FACES
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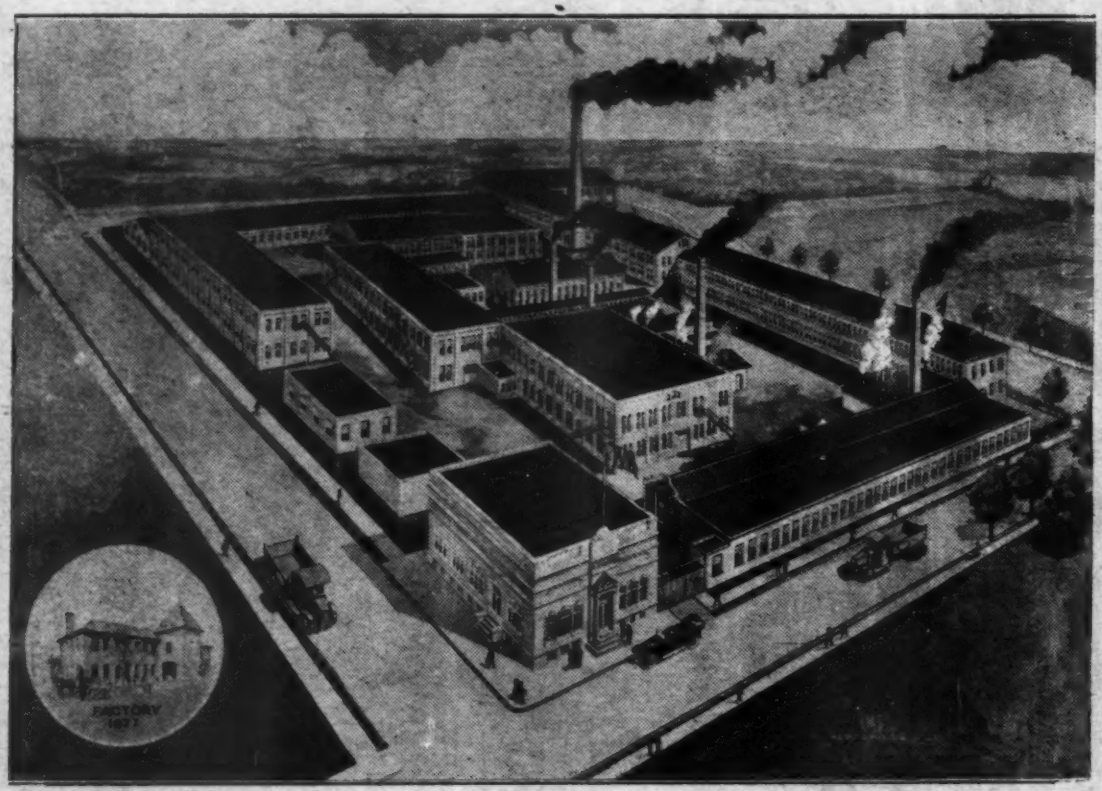

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